

INSTALLATION RESTORATION PROGRAM PHASE II
CONFIRMATION/QUANTIFICATION STA. (U) WESTON (ROY F) INC
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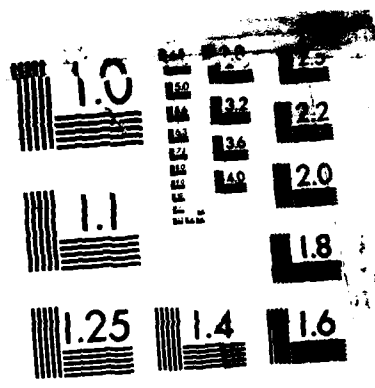
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17 COSATI CODES FIELD GROUP SUB GR		18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
19 ABSTRACT (Continue on reverse if necessary and identify by block number) A problem confirmation study was performed at Castle AFB and included 21 potential contaminant source sites identified in the Phase I Report as requiring field investigation. The potential source sites were grouped into 16 investigation sites including the area of a confirmed plume of TCE contamination in groundwater. The field investigations, conducted from October 1984 to April 1985 included installation of 27 new monitor wells and 11 shallow lysimeters, collection of sediment samples from surface soil, shallow borings, and drainage ditches, geophysical surveys of three sites, two rounds of surface and groundwater sampling and water level measurements, and pilot test operations on a Base production well. Analytes include volatile organic compounds, TOC, TOX, oil and grease, as well as phenols, nitrate, metals, pesticide and herbicides at selected sites. Of the sixteen sites investigated, twelve were recommended for further groundwater study, either through continued monitoring of existing wells, or through expansion of the monitoring network. The TCE plume in the shallow aquifer was delineated and recommended for immediate (con't. on back)			
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(cont.)

feasibility study; additional investigation to locate the source of the plume and to define its extent in off-Base areas and in an underlying aquifer have also been recommended.

Contents of this report:
Distribution, Nomenclature, and
Availability Codes; Order: Statement
of Work; Bibliography - of K. R. ...

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**INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION
STAGE 1**

VOLUME 2 - APPENDICES

FOR

CASTLE AIR FORCE BASE, CALIFORNIA

PREPARED BY:

**Roy F. Weston, Inc.
West Chester, Pennsylvania 19380**

NOVEMBER, 1985

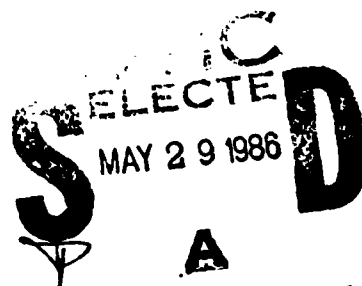
FINAL REPORT FOR PERIOD OCTOBER 1984 TO APRIL 1985

Approved for Public Release; distribution unlimited

PREPARED FOR

**HEADQUARTERS STRATEGIC AIR COMMAND
COMMAND SURGEON'S OFFICE (HQ SAC/SGPB)
BIOENVIRONMENTAL ENGINEERING DIVISION
OFFUTT AIR FORCE BASE, NEBRASKA 68113**

**UNITED STATES AIR FORCE
OCCUPATIONAL & ENVIRONMENTAL HEALTH LABORATORY (USAF OEHL)
TECHNICAL SERVICES DIVISION (TS)
BROOKS AIR FORCE BASE, TEXAS 78235-5501**



INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION
STAGE 1

FOR

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INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION
STAGE 1

APPENDIX

FOR

CASTLE AIR FORCE BASE, CALIFORNIA

STRATEGIC AIR COMMAND
OFFUTT AIR FORCE BASE, NEBRASKA 63113

NOVEMBER 1985

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APPENDIX A

ACRONYMS, DEFINITIONS, NOMENCLATURE,
UNITS OF MEASUREMENT



APPENDIX A

ACRONYMS, DEFINITIONS, NOMENCLATURE, UNITS OF MEASUREMENT

AFB	Air Force Base
AFFF	Aqueous film-forming foam, a fire-fighting agent
AGE	Aerospace Ground Equipment
ALC	Air Logistics Center
ASTM	American Society for Testing and Materials
alluvium	Sedimentary materials deposited in an environment of flowing surface waters.
aquifer	Zone beneath the earth's surface capable of producing water for a well.
artesian	Groundwater condition in which pressure within an aquifer causes groundwater to rise in a well above the top of the aquifer, and sometimes above ground surface.
AVGAS	Aviation gas (fuel)
BEE	Bio-Environmental Engineering
breccia	A rock made up of highly angular coarse fragments.
CAFB	Castle Air Force Base
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
cm/s	Centimeters per second



confined	An aquifer condition in which the more permeable aquifer materials are confined between two less permeable strata, and in which artesian pressures cause water to rise in wells to levels above the base of the upper confining stratum.
confirmed compound	A compound which is identified above the detection limit of the analysis in at least two samples from a sampling point and which is not considered a laboratory or sampling artifact.
DEQPPM	Defense Environmental Quality Program Policy
DMN	Dimethyl-nitrosamine
DoD	Department of Defense
feet/day	Feet per day
groundwater divide	A theoretical dividing line in the water table on each side of which the water table slopes away, forming a boundary between separate groundwater basins.
GC	Gas chromatographic analytical instrument or method.
gpm	Gallons per minute
gpd	Gallons per day
HARM	Hazard Assessment Rating Methodology
HNu	A common brand name for a volatile organic vapor photoionization detection meter.
hydraulic conductivity	Ratio of flow velocity to driving force for viscous flow of water under saturated conditions in a porous medium, or volume of water moving through a unit area of aquifer under a unit hydraulic gradient.
hydraulic gradient	Rate of change in pressure or hydraulic head in groundwater over a given distance of flow.



IRP	Installation Restoration Program
K	Common symbol for hydraulic conductivity.
LOX	Liquid oxygen
meq/L	Milliequivalents per liter, equal to milligrams per liter/ionic weight per valence.
ug/g	Micrograms per gram (equal to mg/kg and equivalent to parts per million in solids).
ug/L	Micrograms per liter (equivalent to parts per billion in water).
mg/L	Milligrams per liter (equivalent to parts per million in water).
mgd	Million gallons per day
MSL	Mean sea level datum
O&G	Oil and grease
OEHL	Occupational and Environmental Health Laboratory
PCB	Polychlorinated biphenyl compound
PD-680	Kerosene-based cleaning agent
perched	A saturated zone above the main saturated groundwater flow zone or aquifer, and separated from the main aquifer by a zone of low permeability.
P.G.	Registered Professional Geologist
POL	Petroleum oil and lubricants
potentiometric (piezometric) surface	Surface defined by the levels to which water will rise in wells penetrating a single aquifer, caused by hydrostatic pressure.

ppb	Parts per billion (equivalent to ug/L in water).
ppm	Parts per million (equivalent to mg/L in water).
RCRA	Resource Conservation and Recovery Act of 1976
SAC	Strategic Air Command
semi-confined	An aquifer condition in which the confining strata above the aquifer are not laterally continuous.
specific capacity	The sustained yield of a well divided by the drawdown in that well after a stabilized pumping condition is obtained (reported in gpm/foot).
square feet/day	Square feet per day
TCE	Trichloroethylene, a volatile organic compound used as a solvent-degreaser.
transmissivity	The volume of water moving per unit time per unit width of a saturated layer under a unit hydraulic gradient.
unconfined	An aquifer in which the water table forms the upper boundary.
unconsolidated sediments	Sediments that are uncemented and thus include interconnected void space (primary porosity) that allows storage and transmission of significant volumes of groundwater.
USAF	United States Air Force
U.S. EPA	United States Environmental Protection Agency
VOA	Volatile organic and aromatic hydrocarbon compounds
water table	The level below which earth materials are saturated with water.

APPENDIX B

TASK ORDER: STATEMENT OF WORK

INSTALLATION RESTORATION PROGRAM
PHASE II (Stage 1)
Castle AFB CA

18 JUN 1984

I. DESCRIPTION OF WORK:

The purpose of this task is to undertake a field investigation at Castle AFB CA to (1) determine the presence or absence of contamination within the specified areas of investigation; and (2) if contamination exists, determine the potential for migration of those contaminants in the various environmental media, and (3) to identify any additional investigations and their attended cost necessary to determine the magnitude, extent, direction and rate of migration of discovered contaminants.

The Phase I IRP Report (mailed under separate cover) incorporates the background and description of the sites for this task. To accomplish this survey effort, the contractor shall:

1. Monitor all exploratory borehole and well drilling operations with a photo-ionization meter or equivalent organic vapor detection device for potential generation of hazardous and/or toxic materials. Results of monitoring shall be included in boring and well logs.

2. Determine the areal extent of the sites by reviewing available aerial photos of the base, both historical and the most recent panchromatic and infrared.

3. The locations where surface water samples are collected mark with permanent marker, and record on a site specific map.

4. Analyze on site, all water samples collected for pH, temperature, and specific conductance. Sampling, maximum holding time and preservation of samples for laboratory analysis shall comply strictly with the following references: Standard Methods for the Examination of Water and Wastewater, 15th Ed. (1980); ASTM Section II, Water and Environmental Technology; and Methods for Chemical Analysis of Water and Wastes, EPA Manual 600/4-79-020 (1979).

5. Split all water and soil samples as part of the contractors specific Quality Assurance/Quality Control (QA/QC) protocols and procedures. One set of samples shall be analyzed by the contractor and the other set of samples shall be forwarded for analysis through overnight delivery to:

USAF OEHL/SA
Bldg 140
Brooks AFB TX 78235

The samples sent to the USAF OEHL/SA shall be accompanied by the following information:

- (a) Purpose of sample (analyte)
- (b) Installation name (base)
- (c) Sample number (on containers)
- (d) Source/location of sample
- (e) Contract Task Numbers and Title of Project
- (f) Method of collection (bailer, suction pump, air-lift pump, etc.)
- (g) Volumes removed before sample taken
- (h) Special conditions (use of surrogate standard, special nonstandard preservations, etc.)
- (i) Preservatives used

This information shall be forwarded with each sample by properly completing an AF Form 2752 (copy of form and instruction on proper completion mailed under separate cover). In addition, copies of field logs documenting sample collection should accompany the samples.

Chain-of-custody records for all samples, field blanks and quality control duplicates shall be maintained.

6. For ground water monitoring wells, comply with U.S. EPA Publication 330/9-S1-002, NEIC Manual for Ground Water/Subsurface Investigations at Hazardous Waste Sites for monitoring well installation. Only screw type joints shall be used.

7. Wells shall be of sufficient depth to collect samples representative of aquifer quality and to intercept contaminants if they are present. Well development shall proceed until the discharge water is clear and free of sediment to the fullest extent possible.

8. Elevations of all newly installed monitoring wells, lysimeters, staff gauge stations and an existing well shall be surveyed with respect to bench mark on base to an accuracy of ± 0.05 feet. Horizontally locate to an

accuracy of '10 feet all monitoring wells, lysimeters and staff gauge stations and record on site map.

9. After well development, survey and a time to be specified by the contractor for water level stabilization, synoptic ground water level measurements shall be recorded in both wet and dry season conditions, using an electric tape.

10. All water quality sampling events identified in site specific work shall be conducted two times, once during wet seasonal conditions and once during dry seasonal conditions. All water quality sampling shall be conducted at same time as seasonal water level measuring periods in paragraph 9 above. Detection limits for water quality analyses are defined in Attachment 1. All contractor QA/QC sample analysis results shall be included in analytical results in draft final report.

11. All monitor wells shall be drilled using the following specifications:

a. Each well shall be drilled with a 10-inch outside diameter drill bit using conventional mud rotary drilling equipment. Samples shall be taken for stratigraphic control purposes at 5-foot intervals by collecting cuttings from the mud pump discharge stream. Each pilot boring log and well completion summaries shall be included in the Final Report (as specified in Item VI below).

b. The average depth of each of these wells shall be 100 feet. Each well shall be constructed of 4-inch diameter low-carbon steel using threaded, non-glued fittings. Each well shall be screened 40 feet using stainless steel (wire wound) well screen. Each well shall be gravel-packed with Ottawa gravel, or local equivalent, to a height of 5 feet above the top of the well screen, and shall be pressure grouted with a grout mixture of 6:1 Portland cement and bentonite powder. Each well shall be completed with installation of a cap and locking hasp and shall be clearly numbered with an exterior paint.

c. Lysimeters shall be installed as shallow 2-inch diameter PVC monitor wells with short screens emplaced just above the hardpan. Each lysimeter shall be gravel-packed and grout-sealed as described above. Each lysimeter shall be completed with installation of a 4-inch diameter security casing equipped with a locking cap.

12. Each well shall be developed with stainless steel bailer, stainless steel submersible pump or bladder pump until clean of suspended solids.

13. Wells shall be purged of at least 3-5 well volumes of water prior to sampling. Purging shall be completed by using a stainless steel submersible pump or bladder pump. All sampling shall be conducted using a Kemmerer sampler or Teflon bailer.

14. All chemical analysis (water and soil) shall meet the required limits of detection for applicable EPA method identified in Attachment 1.

15. Second-column confirmation shall be required when detection limits exceed values identified in Attachment 2, for EPA Methods 601, 602, 608 and Standard Methods 509A and 509B. It is estimated that 25% of the samples collected for these analyses shall require 2nd-column confirmation.

16. Field data collected for each site shall be plotted and mapped according to surveyed positions. The nature of contamination and the magnitude and potential for contaminant flow within each site, to site to receiving streams and ground waters shall be determined or estimated. As analytical results are received, they shall be tabulated and incorporated into the next R&D Status Report (as specified in Item VI below).

In addition to the general items delineated in Paragraph 1-16 above, conduct the following specific efforts at the following zones and sites. All the sites and zones are identified in Figure 1.

Site 1 - TCE Contaminant Plume (See Figure 2)

a. The contractor shall conduct the following sequence of pilot test operations on base production Well No. 3 in order to determine whether or not inter-aquifer transfer of contaminants is occurring via the mechanism of down-casing leakage:

- o Measure water level on existing test Well No. 14
- o Collect groundwater sample from production Well No. 3 and monitor Well No. 14. Analyze the groundwater sample for Purgeable Halocarbon and Aromatics (using U.S. EPA Methods 601 & 602).
- o Terminate pumping on production Well No. 3 and monitor test Well No. 14 water levels for changes using an electric tape.
- o Remove turbine pump from production Well No. 3, and run a gamma log and other down-hole geophysical logs in order to verify the intervals of major confining beds.
- o Select two 10-foot intervals, one at the upper end of the confining interval and one at the base of the confining interval, for test grouting.
- o Using a high-pressure down-hole tool perforate the casing in the two 10-foot intervals selected, and inject high-pressure grout through the perforations and into the formation to form a grout seal in the annular space outside the well casing.
- o Collect a groundwater water sample from the base of the standing water column in the casing using a Kemmerer sampler and repeat this procedure after 48 hours. Analyze both water samples for Purgeable Halocarbons and Aromatics (using U.S. EPA Methods 601 & 602).

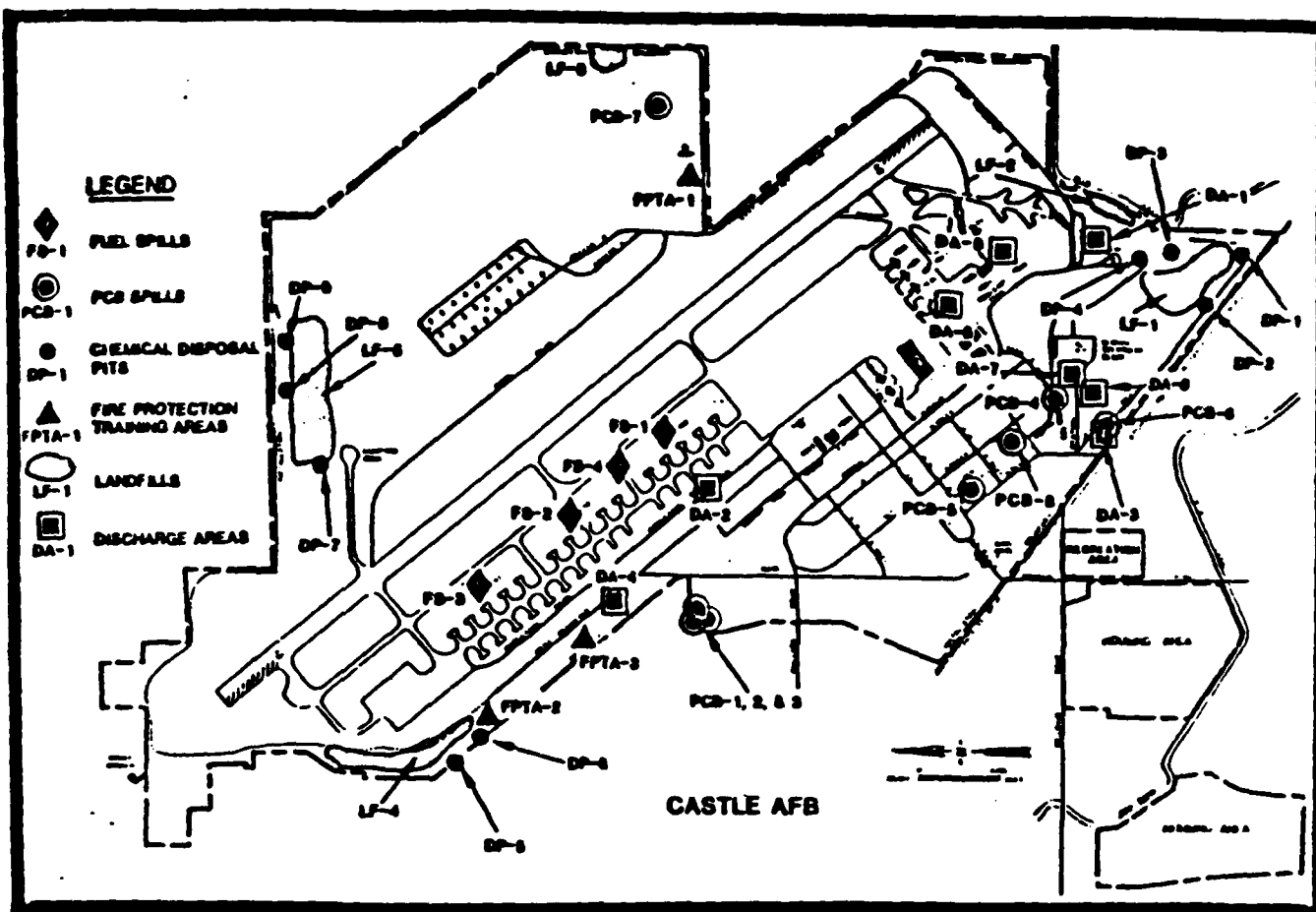
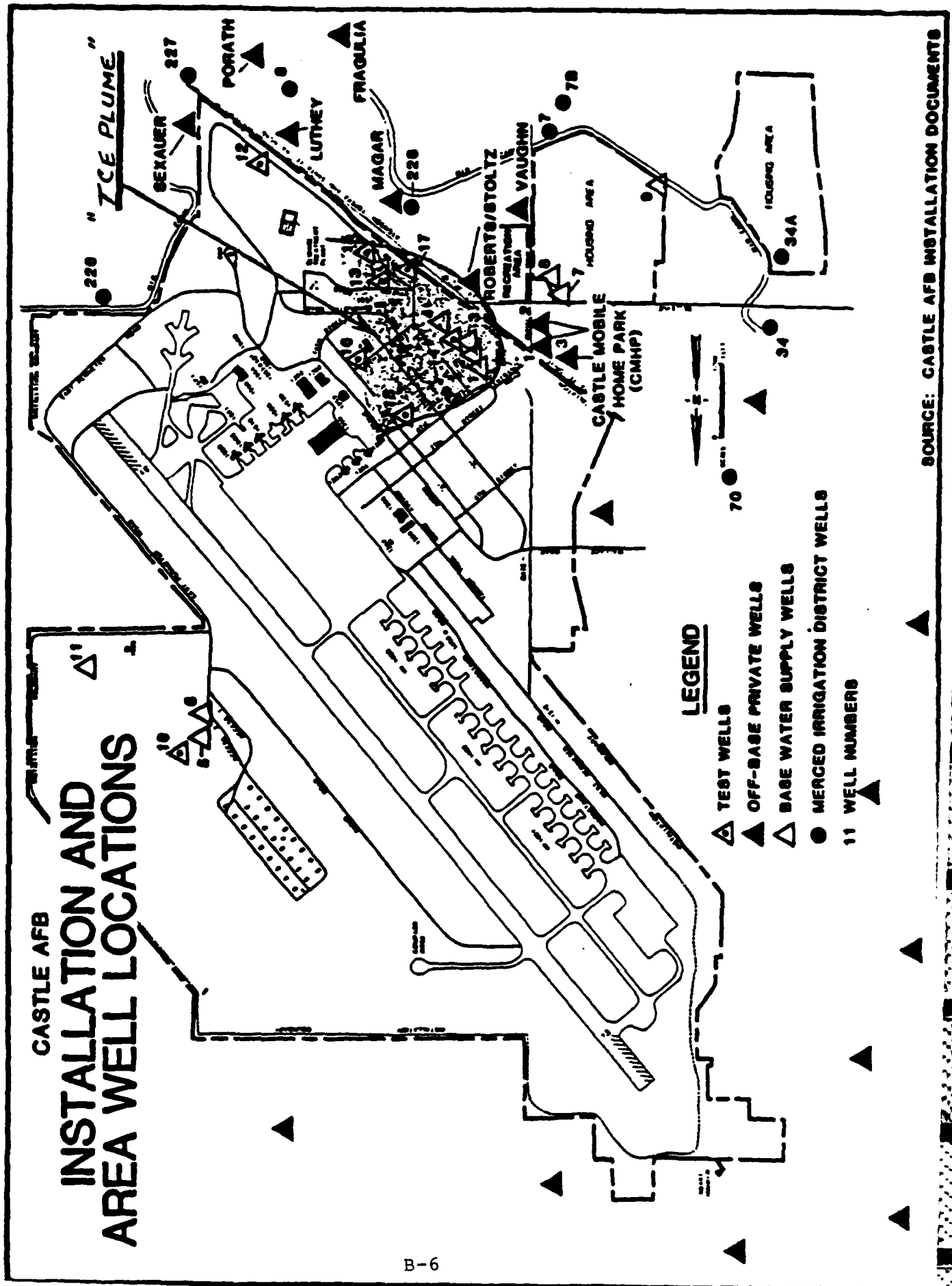


Figure 1: LOCATIONS OF SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION

- South Landfill Zone - Landfills 1 and 2, Discharge Area 1, Disposal Pits 1, 2, 3 and 4
- Discharge Area 8
- Fire Training Area 1
- North Landfill Zone - Landfill 3, Disposal Pits 7, 8 and 9
- West Landfill Zone - Landfill 4, Disposal Pits 5 and 6, Fire Training Area 2
- PCB spills 1, 2 and 3
- Fuel Spills 1, 2, 3 and 4
- Discharge Area 2
- Discharge Area 4
- Discharge Area 5
- Discharge Area 7
- Discharge Area 6
- Fire Training Area 3
- Landfill 3.

FIGURE 2



SOURCE: CASTLE AFB INSTALLATION DOCUMENTS

- o Reinstall the turbine pump into the well after measuring the static water level using an electric tape.
- o Restart the pump up to full, normal production capacity, while monitoring water levels in test Well No. 14 for changes using an electric tape.
- o Following sequence of pilot test operations' collect a groundwater sample from Well No. 3 once a week for six weeks. Analyze each of the six (6) groundwater samples for purgeable Halocarbons and Aromatics (using U.S. EPA Methods 601 & 602).

b. (1) The contractor shall drill and construct 2 monitoring wells within the TCE contaminant plume zone defined by shaded area in Figure 2.

Specific locations of wells shall be determined by contractor in the field. The wells shall be generally located as follows:

- o One well at the base boundary on-line between the Roberts/Stoltz well off-base and base production Well No. 4.
- o One well at the base boundary on-line between base production well No. 1 and the Castle Mobile Home Park wells off-base.

(2) One groundwater sample shall be collected and analyzed (as specified for site TCE Plume in Table 1) for water quality from each of the two newly developed monitoring wells above and existing test wells No. 13-18 and base production wells No. 1-8.

South Landfill Zone (SLFZ)

1. The contractor shall drill four soil exploratory borings along the course of the drainage swale from the Jet Engine Test Facility (Bldg 953). Borings shall be keyed to locations of surface discoloration. The soils shall be sampled on a continuous basis to top of the hardpan or 10 feet, whichever occurs first. Soil samples shall be collected from every 1 foot interval. The samples collected from the 0 to 1 foot, 4 to 5 foot and the final foot above hardpan interval shall be analyzed as specified for this site in Table 1. All other soil samples shall be archived frozen for possible future analysis.

2. The contractor shall conduct a combined magnetometer and ground Penetrating Radar (GPR) survey of disposal Pit 3 on a broad survey grid pattern to determine the outlines of the pit and the presence or absence of buried drums.

3. The contractor shall drill and install 6 monitor wells and 2 lysimeters within the South Landfill Zone in order to determine if the potential exists for groundwater contamination from sites within the zone. The specific locations of the monitor wells shall be determined by the contractor in the field, but the contractor shall generally locate the wells as follows:

- o One well upgradient of Landfill 1 near the confluence of the two drainage courses.

- o One well upgradient of Landfill 2 between the landfill and the southeastern base boundary at the M.I.D. canal.
 - o Two wells downgradient of Landfill 1.
 - o Two wells downgradient of Landfill 2 and Discharge Area 1.
 - o Two lysimeters downgradient of Landfill 1, installed as clusters with two downgradient monitoring wells.
4. The contractor shall establish for water level and water quality sampling purposes, 6 permanently marked and surveyed staff gauge stations along the 2 drainage courses forming boundaries of the zone to the southeast and southwest.
5. The contractor shall collect a water sample from each of the newly installed monitoring wells, lysimeters, staff gauge stations and test well No. 12 for water quality analysis identified for site SLFZ in Table 1.

Discharge Area 8 (DA-8)

1. The contractor shall conduct a combined magnetometer and GPR survey of the area around Building 1550 to establish the location of the former overflow discharge line connecting the drainage ditch with building.
2. The contractor shall drill and install 3 monitoring wells in order to determine if the potential exists for groundwater contamination from the site. Specific locations of the wells shall be determined in the field by the contractor, but shall generally be located with one well upgradient of the site and 2 wells downgradient of the site.
3. The contractor shall establish for water level, water quality and bottom sediment sampling purposes, 3 permanently marked and surveyed staff gauge stations, along the surface drainageway downstream of the outfall. The contractor shall collect a 2-foot long bottom sediment core at each staff gauge station. Each core sample shall be subdivided into one-foot segments and analyzed for the analytes identified for site DA-8 in Table 1.
4. The contractor shall collect water samples from each of the newly installed monitoring wells and staff gauge stations for water quality analysis identified for site DA-8 in Table 1.

Fire Training Area 2 (FT-1)

1. The contractor shall drill and install 3 monitor wells and 2 lysimeters around the site, in order to determine if the potential exists for groundwater contamination from site. The specific location shall be determined by the contractor in the field, but generally shall be located such that one well is upgradient of the site and two wells are downgradient of the site. The 2 lysimeters shall be paired with the downgradient monitoring wells.

TABLE 1: BY SITE ANALYTICAL PROGRAM FOR EACH ROUND OF SAMPLING

ANALYTE	METHODS	MEDIUM	TCS															
			PLUMB	SLFZ	SLFZ	DA-1	ET-1	SLFZ	SLFZ	ET-1	ET-1	DA-1	DA-1	DA-1	DA-1	DA-1	DA-1	DA TOTAL
Purgeblow:																		
Halocarbons and Aromatics (EPA 601 & 602)		Groundwater	12	9	3	3	9	6	4	0	3	1	0	0	0	0	0	2 11 68
Halocarbons and Aromatics (EPA 601 & 602)		Surface Water	0	6	3	3	0	0	0	0	0	0	0	0	0	0	0	2 11
Halocarbons and Aromatics (EPA 601 & 602)		Soils*	0	12	4	0	0	0	0	0	0	0	0	0	0	0	0	2 11
Oil & Grease		Groundwater	12	9	3	3	9	6	4	0	3	1	0	0	0	0	0	2 11 68
Oil & Grease		Surface Water	0	6	3	3	0	0	0	0	0	0	0	0	0	0	0	2 11
Oil & Grease		Soils	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	2 11
Phenols		Groundwater	12	9	0	0	9	6	4	0	3	1	0	0	0	0	0	2 10 64
Phenols		Surface Water	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2 10
TOX		Groundwater	12	9	0	0	9	6	4	0	3	1	0	0	0	0	0	2 10 39
TOX		Surface Water	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2 10
Methylthylketone		Groundwater	12	9	0	0	9	6	4	0	3	1	0	0	0	0	0	2 10 39
Methylthylketone		Surface Water	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2 10
Metals*		Groundwater	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	2 5 30
Metals*		Surface Water	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2 5
Nitrate Ion (EPA 353.2)		Groundwater	0	9	0	0	9	6	4	0	0	0	0	0	0	0	0	2 7 43
Nitrate Ion (EPA 353.2)		Surface Water	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2 7
Pesticides/Herbicides*		Groundwater	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	2 3 30
Pesticides/Herbicides*		Surface Water	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2 3
Pesticides/Herbicides*		Soils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 1 7
TDC		Groundwater	12	9	3	3	9	6	4	0	3	1	0	0	0	0	0	2 11 68
TDC		Surface Water	0	6	3	3	0	0	0	0	0	0	0	0	0	0	0	2 11
PCB		Soils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 1 4

B 1. Temperature, specific conductance and pH will be measured in the field.

2. Soils will be sampled and analyzed only one.

3. Metals include: Cadmium (EPA 213.2), Chromium (EPA 216.1), Lead (EPA 239.2), Manganese (EPA 245.1) and Silver (EPA 272.2).

4. Pesticides/Herbicides, include: Endrin, Lindane, Methoxychlor, Toxaphen (Standard 509A) and 2,4-D, 2,4,5 TP (Silvex (Standard 509B)).

2. The contractor shall collect water samples from each of the newly installed monitoring wells, lysimeters, test well No. 19 and Production Wells 5, 6 and 11 for water quality analyses identified for site FPTA-1 in Table 1.

North Landfill Zone (NLFZ)

1. The contractor shall conduct a combined magnetometer and GPR survey of Landfill 5 on a broad survey grid pattern to determine the outlines of the landfill and the presence or absence of buried drums.
2. The contractor shall drill and install 4 monitoring wells and 2 lysimeters in order to evaluate the potential for groundwater contamination from the site. The specific locations of the wells and lysimeters shall be determined by the contractor in the field, but they shall be generally located such that one well is upgradient of the site and three wells are located downgradient of the site. The 2 lysimeters shall be paired with downgradient monitor wells.
3. The contractor shall collect water samples from each of the newly installed monitoring wells and lysimeters for water quality analyses identified for site NLFZ in Table 1.

West Landfill Zone (WLFZ)

1. The contractor shall drill and install 4 monitoring wells around the zone in order to determine if the potential exists for groundwater contamination from sites within the zone. The contractor shall determine in the field the specific locations of these monitoring wells, but each shall be generally located such that one well is located upgradient of the site and three monitoring wells are located downgradient of the site.
2. The contractor shall collect water samples from each of the newly installed monitoring wells for water quality analysis identified for site WLFZ in Table 1.

PCB Spills 1, 2 and 3 (PCB)

1. The contractor shall review base records documenting clean up and disposal of PCB contaminated soils in the spill areas.
2. The contractor shall collect 6 shallow soil auger cores, 2 from each spill area and composite the cores from each area into 3 composites. The 3 composite samples shall be analyzed for analytes identified for site PCB in Table 1.

Fuel Spills 1, 2, 3 and 4 (FS1-4)

1. The contractor shall drill and install one monitoring well and 4 lysimeters around the site, in order to evaluate the potential for groundwater contamination from the site. The specific location of the monitoring well and

lysimeters shall be determined by the contractor in the field, but shall generally be located such that the monitoring well is located downgradient of Fuel Spill 3 and one lysimeter located downgradient of each spill site.

2. The contractor shall collect water samples from the newly installed monitoring well and each lysimeter for water quality analyses identified for site FS1-4 in Table 1.

Discharge Area 2 (DA-2)

1. The contractor shall drill and install 1 monitoring well downgradient of the site to determine if the potential exists for groundwater contamination from the site.

2. The contractor shall collect a water sample from the newly installed monitoring well for water quality analyses identified for site DA-2 in Table 1.

Discharge Area 4 (DA-4)

The contractor shall drill and sample 2 soil exploratory borings in the trichlorethylene spill area adjacent to the Liquid Oxygen Plant (Building 1316). Borings shall be keyed to locations of surface vegetation distress. The contractor shall sample soils on a continuous basis to the top of the hardpan or to 10 feet, whichever occurs first. The soil samples shall be collected in 1-foot intervals, the zero to one foot, 4 to 5 foot and the final foot above hardpan interval shall be analyzed for analytes identified for site DA-4 in Table 1. All the other soil samples shall be archived frozen for possible future analyses.

Discharge Area 7 (DA-7)

The contractor shall collect six hand-auger soil samples to depths of 0.5 feet around the site. The sample shall then be composited into two 3-sample composites. The soil samples shall be analyzed for analytes identified for site DA-7 in Table 1.

Discharge Area 3 (DA-3)

The contractor shall collect two 2-foot long core samples of the bottom sediments from the drainage ditch running off-post and parallel to the base boundary. Each 2 foot core sample shall be subdivided into one-foot segments. Each one-foot sample shall be analyzed for analytes identified for site DA-3 in Table 1.

Discharge Area 6 (DA-6)

The contractor shall collect water samples from test wells No. 13, 15 and 17 and Production Well No. 4 located in this area for water quality analyses identified for site DA-6 in Table 1.

Fire Training Area (FT-3)

1. The contractor shall drill and install one monitoring well and lysimeter downgradient of the site to determine if the potential exists for groundwater contamination from the site.
2. The contractor shall collect a water quality sample from newly installed monitoring well and lysimeter for water quality analyses identified for site FT-3 in Table 1.

Landfill No. 3 (LF-3)

1. The contractor shall drill and install 2 monitoring wells around the site in order to determine if the potential exists for groundwater contamination from the site. The specific location of the monitoring wells shall be determined by the contractor in the field, but each shall be generally located downgradient of the site.
2. The contractor shall collect a water sample from each newly installed monitoring well for water quality analysis identified for site LF-3 in Table 1.

A total of 25 monitoring wells and 11 lysimeters shall be installed during this field investigation.

C. Well and Borehole Cleanup

The well and boring area shall be cleaned following the completion of each well and boring. Drill cuttings shall be removed and the general area cleaned. If in the process of drilling hazardous wastes are generated the contractor shall be responsible for proper containerization and identification (according to local civil engineering office requirements) for eventual government disposal. Disposal of the containers are not the responsibility of the contractor.

D. Data Review

At the completion of all analyses the contractor shall tabulate and incorporate all the results into an informal technical report (Atch 1 Sequence 3, as specified in Item VI below) prior to submission of draft report and forwarded to the USAF OEHL for review.

E. Equipment

Equipment purchased to accomplish the requirements of this task, including the requirement for proper maintenance of quality control samples, shall be the property of the USAF OEHL.

F. Reporting

1. A draft report delineating all findings of this field investigation shall be prepared and forwarded to the USAF OEHL (as specified in Item VI below) for Air Force review and comment. This report shall include a discussion of the regional/site specific hydrogeology, well and boring logs, data

from water level surveys, groundwater surface and gradient maps, vertical, water quality and soil analysis results, available geohydrologic cross sections and laboratory quality assurance information. The report shall follow the USAF OEHL supplied format (mailed under separate cover).

The recommendation section will address each site and list them by categories. Category I will consist of sites where no further action (including remedial action is required). Data for these sites is considered sufficient to rule out unacceptable health or environmental risks. Category II sites are those requiring additional monitoring or work to quantify or further assess the extent of current or future contamination. Category III sites are sites that will require remedial actions (ready for IRP Phase IV actions). In each case the contractor will summarize or present the results of field data, environmental or regulatory criteria, or other pertinent information supporting these conclusions.

G. Meetings

The contractors project leader shall attend two meetings with representatives of HQ SAC/SG, Castle AFB/SG/DE, USAF OEHL and regulatory agencies to take place at a time to be specified by the USAF OEHL. Each meeting shall take place at Castle AFB for a duration of one day (eight hours).

II. SITE LOCATION AND DATES:

Castle AFB CA
Date to be established

III. BASE SUPPORT: None

IV. GOVERNMENT FURNISHED PROPERTY: None

V. GOVERNMENT POINTS OF CONTACT:

- | | |
|--|--|
| 1. Capt Robert W. Bauer
USAF OEHL/TSS
Brooks AFB TX 78235
(512) 536-2158/2159
AV 240-2158/2158 | 2. Captain Stephen P. Hedrick
USAF Hospital Castle/SGPB
Castle AFB CA 95342
(290) 726-2410
AV 347-2410 |
| 3. Colonel Ronald D. Burnett
HQ SAC/SGPB
Offutt AFB NE 68113
(402) 294-4651
AV 271-4651 | |

VI. In addition to sequence numbers 1, 5 and 11 in Attachment 1 to the contract, which are applicable to all orders, the sequence numbers listed below are applicable to this order. Also shown are data applicable to this order.

<u>Sequence No.</u>	<u>Block 10</u>	<u>Block 11</u>	<u>Block 12</u>	<u>Block 13</u>	<u>Block 14</u>
3	One/T	*	*		
4	One/R	13 JUN 85	28 JUN 85	29 NOV 85	**

* Upon completion of analytical effort before submission of 1st draft report.

** Two draft reports will be required. After incorporating Air Force comments concerning each draft report, the contractor shall supply the USAF OEHL with one copy of the second Draft/Final. Upon OEHL acceptance of the second draft, the contractor shall distribute the remaining copies per an OEHL prepared distribution list. The contractor shall supply the USAF OEHL with 25 copies of each draft report and 50 copies plus the original camera ready copy of the final report.

Attachment 1

Analytical Detection Limits

<u>ANALYTE</u>	<u>METHOD</u>	<u>LIMIT (µg/L) water,</u> <u>µg/g soil</u>
Purgeable: Halocarbons and Aromatics	EPA 601 and 602	*
Oil & Grease (using IR)	EPA 413.2	100
Phenol	EPA 420.1	1
Total Organic Halogen (TOX)	EPA 9020	5
Methyl Ethyl Ketone (MEK)	EPA 503.1	1
METALS:		
Cadmium	EPA 213.2	10
Chromium	EPA 218.1	50
Lead	EPA 239.2	20
Mercury	EPA 245.1	1.0
Silver	EPA 272.2	10.
Nitrate	EPA 353.2	100
PESTICIDES/HERBICIDES:		
Endrin	Standard 509A	.02
Lindane	Standard 509A	.01
Methoxychlor	Standard 509A	.20
Toxaphen	Standard 509A	1
2,4-D	Standard 509B	.06
2,4,5-TP (silvex)	Standard 509B	.06
Total Organic Carbon (TOC) EPA 415.1		1000
Polychlorinated Biphenyls (PCB) EPA 608		1**

*As specified by Method 601 & 602

**Identify PCB type if possible

Attachment 2

If analytes analyses exceed the detection limits identified below, 2nd column confirmation shall be required:

<u>EPA Method 601 & 602</u>	<u>Detection Level (ug/L)</u>
Benzene	0.7
Carbon	4.0
Chloroform	10
1,2 Dichloroethane	0.1
Methylene Chloride	4.0
Tetrachloroethylene	4.0
Toluene	10
1,1,1-Trichloroethane	10
Trichloroethylene	1.0
Vinyl Chloride	1.0
Dichlorobenzene isomers any	Sum greater than 10
Other organics greater than	10

<u>EPA Method 608 and Standard Methods 509A & 509B</u>	<u>Detection Level ug/L</u>
Aldrin	10
Alpha BHC	0.7
Beta BHC	0.3
Gamma BHC	0.3
Lindane	4.0
2,4-D	10
2,4,5-T	10
2,4,5-TP (Silvex)	10
Dieldrin	10
Heptachlor	0.02
Heptachlor epoxide	0.01
any other pesticide greater than	10

"Retention times on both columns must match before reporting positive value. If no match, it will be considered an interference."

APPENDIX C

BIOGRAPHIES OF KEY PERSONNEL



Peter J. Marks

Fields of Competence

Project management; environmental analytical laboratory analysis; hazardous waste, groundwater and soil contamination; source emissions/ambient air sampling; wastewater treatment; biological monitoring methods; and environmental engineering.

Experience Summary

Eighteen years in Environmental Laboratory and Environmental Engineering as Project Scientist, Project Engineer, Process Development Supervisor, and Manager of Environmental Laboratory with WESTON. Experience in analytical laboratory, wastewater surveys, hazardous waste, groundwater and soil contamination, DoD-specific wastes, stream surveys, process development studies, and source emission and ambient air testing. In-depth experience in pulp and paper, steel, organic chemicals, pharmaceutical, glass, petroleum, petrochemical, metal plating, food industries and DoD.

Applied research on a number of advanced wastewater treatment projects funded by Federal EPA.

Credentials

B.S., Biology—Franklin and Marshall College (1963)

M.S., Environmental Engineering and Science—Drexel University (1965)

American Society for Testing and Materials

Water Pollution Control Federation

Water Pollution Control Association of Pennsylvania

Employment History

1965-Present WESTON

1963-1964 Lancaster County General Hospital
Research Laboratory for Analytical
Methods Development

Key Projects

USAF/OEHL Brooks AFB. Program Manager for this three-year BOA contract provides technical support in environmental engineering surveys, wastewater characterization programs, geological investigations, hydrogeological studies, landfill leachate monitoring and landfill siting investigations, bioassay studies, wastewater and hazardous waste treatability studies, and laboratory testing and/or field investigations of environmental instrumentation/equipment. Collection, analysis, and reporting of contaminants present in water and wastewater samples in support of Air Force Environmental Health Programs.

United States Army Toxic and Hazardous Materials Agency (USATHAMA), Aberdeen Proving Ground, Maryland. Program Manager for three-year basic ordering agreement contract to provide research and development for technology in support of the DOD Installation Restoration Program. The objective of the Program is to identify and develop treatment methods/technology for containment and/or remedial action. Technology development for remedial action is to include groundwater, soils, sediments, and sludges.

Confidential Client, Ohio. Project Manager of an on-going contract to conduct corporate environmental testing and special projects at client's U.S. and overseas plants. WESTON must be able to assign up to four professionals to a project within a two week notice.

Confidential Client (Inorganic and Organic Chemicals). Product Manager of a current contract to conduct wastewater sampling and analysis of plant effluent for priority pollutants. The project also includes a wastewater treatability study to evaluate a number of process alternatives for removal of priority pollutants from the present effluent.

Confidential Client, Utah. Technical Project Manager for in-depth wastewater survey, in-plant study, treatability study, and concept engineering study in support of the client's objectives to meet 1983 effluent limitations. WESTON had two project engineers, two chemists, five technicians and an operating laboratory in the field. Field effort is six months duration.

Professional Profile



Frederick Bopp III, Ph.D., P.G.

Registration

Registered Professional Geologist in the State of Indiana

Fields of Competence

Groundwater resources evaluation; hydrogeologic evaluation of sanitary landfills and other waste disposal sites; detection and abatement of groundwater pollution; digital modeling of groundwater flow and solute transport; statistical analysis of geological and geochemical data; geochemical prospecting; estuarine geology and geochemistry; trace metal and aqueous geochemistry.

Experience Summary

Seven years experience in hydrogeology and geochemistry, involving such activities as: assessment of subsurface water and soil contamination; development of contamination profiles; evaluation of remediation actions for groundwater quality restoration; quantitative chemical analysis of water and soil; ore assay and ore body evaluation; drilling supervisor; hydrogeologic assessment; pollution detection and abatement; estuarine pollution analysis; application of flow and solute transport computer models; computer programming; project management; teaching environmental geology and geochemistry.

Credentials

B.A., Geology—Brown University (1966)

M.S., Geology—University of Delaware (1973)

Ph.D., Geology—University of Delaware (1979)

Sigma Xi, The Scientific Research Society of North America

Geological Society of America, Hydrology Division

National Water Well Association, Technical Division

American Association for the Advancement of Science

Estuarine Research Federation; Atlantic Estuarine Research Society

Employment History

1979-Present	WESTON
1977-1979	U.S. Army Corps of Engineers Waterways Experiment Station
1976-1977	University of South Florida Department of Geology
1970-1976	University of Delaware Department of Geology
1974-1976	Earth Quest Associates President and Principal Partner
1974 (Summer)	WESTON
1966-1970	United States Navy Commissioned Officer

Key Projects

Project manager on seven task orders for environmental assessment services at United States Air Force facilities in nine states.

Task manager for a Superfund site evaluation in Ohio.

Site manager for drum recovery operations in Pennsylvania and New Jersey.

Project manager for site assessments of oil and fuel spills in four states.

Project manager for closure plan development at a hazardous waste landfill in New Jersey.

Definition and abatement of groundwater contamination from chemical manufacturing in Delaware.

Flow and solute transport digital model of a heavily-pumped regional aquifer in southern New Jersey.

Definition and abatement of groundwater contamination from chemical manufacturing in the Denver area.

Hydrogeologic impact assessment of on-land dredge spoil disposal in coastal North Carolina.

Geochemical prospecting and ore body analysis in Arizona.

Professional Profile



Walter M. Leis, P.G.

Registration

Registered Professional Geologist in the States of Georgia (No. 440) and Indiana.

Fields of Competence

Detection and abatement of groundwater contamination; design of artificial recharge wells; deep well disposal; simulation of groundwater systems; hydrogeologic evaluation of hazardous waste sites and landfills; practical applications of geophysical surveys to hydrologic systems, site investigations, and borehole geophysical surveys. Geochemical studies of acid mine drainage and hazardous wastes.

Experience Summary

Sixteen years experience as field hydrogeologist, field supervisor, project director, research director. Six years research involving two consecutive projects: 1) application of geophysical techniques in evaluating groundwater supplies in fractured rock terrain in Delaware and Pennsylvania; 2) project director for an artificial recharge and deep well disposal study. Provided consultation for waste disposal and aquifer quality problems for coastal communities.

Developed geochemical sampling techniques for deep mine sampling. Evaluated synthetic and field hydrologic data for deep formational analysis in coal field projects.

Earlier research experience involved developing techniques for mapping subsurface regional structures having interstate hydrologic significance, and defining ore bodies by geochemical prospecting.

Credentials

B.S., Biochemistry—Albright College (1966)

M.S., Hydrogeology—University of Delaware (1975)

Cooperative Program Environmental Engineering—University of Pennsylvania

Additional special course work in Geology and Hydrology, Franklin and Marshall College and Pennsylvania State University

Remote Sensing Data Processing Training, Goddard Space Center (1978)

OWRR Research Fellow, 1973

National Water Well Association, Technical Division.

Geological Society of America, Engineering Geological Division.

Society of Economic Paleontologists and Mineralogists

Employment History

1974-Present	WESTON
1973-1974	University of Delaware Water Resources Center
1971-1973	University of Delaware
1967-1971	Pennsylvania Department of Environmental Resources

Key Projects

Definition of groundwater contamination from sanitary landfill leachate and recovery of contaminants to protect heavily used aquifer in Delaware.

Field design studies for artificial recharge and waste disposal wells.

Design and construction of hydrologic isolation systems for various class hazardous wastes.

Design and supervision of chemical and physical rehabilitation of groundwater collection systems in fractured rock and coastal plain areas.

Principal investigator for six projects involving subsurface migration of PCB's in New York, New Jersey, Pennsylvania, and Oklahoma.

Design and construction supervision of hydrocarbon recovery wells in Pennsylvania.

Professional Profile



Katherine A. Sheedy

Fields of Competence

Geologic investigation and site evaluation; environmental impact assessment, quantitative and qualitative groundwater analysis, design of groundwater monitoring systems.

Experience Summary

Nine years experience in geological investigations including environmental impact analysis in geology, groundwater, and soils; hydrogeologic investigations of hazardous waste sites, preparation and delivery of expert testimony; assessment and mitigation of low-level radioactive contamination of groundwater and soils; migration of low-level radioactive contamination of groundwater and soils; migration of radionuclides in groundwater; site stability in limestone terrains; development of evaluation criteria for site search and selection projects; pre-mine opening hydrologic investigations for surface and underground coal mines; development of clean-up strategies for hazardous and radioactive waste disposal sites; Environmental Impact Statement preparation and review; site suitability investigations of waste disposal facilities for industrial and residential developments.

Credentials

B.A.—Queens College, CUNY (1969)

M.S., Geology—University of Delaware (1975)

American Geophysical Union

Geological Society of America

National Water Well Association, Technical Division

Employment History

1974-Present WESTON

1972-1974 University of Delaware

Key Projects

Preparation of RCRA Part B permit application for facilities in the Midwest and on the West coast.

Initial Assessment Studies to identify possible contamination resulting from past practices at military installations.

Assessment of groundwater contamination from a municipal landfill in the Atlantic Coastal Plain including aquifer simulation to determine migration 10, 20 and 30 years in the future.

Hydrogeologic assessment of a multi-source military installation. The project includes groundwater modeling for the installation and for areas outside the installation in conjunction with State and Federal agencies.

Design of monitoring systems for a large industrial complex in Montana.

Assessment of regulatory requirements for hazardous waste lagoon closure in over forty states.

Assessment and analysis of emerging trends in groundwater research as applied to the utility industry.

Preparation of EPA Remedial Action Master Plans for five uncontrolled hazardous waste sites.

Principal investigator for geology, soils and groundwater portion of an Environmental Impact Statement for the decontamination of a radioactive waste disposal site in Canonsburg, Pennsylvania.

Project manager and principal investigator on clean-up of a site contaminated by pharmaceutical wastes in New Jersey.

Project manager and principal investigator for assistance in EIS preparation for five synthetic fuel plants in east-central United States.

Evaluation of environmental impact and operation of 23 municipal landfills in the Atlantic Coastal Plain.

Hydrogeologic investigations at mine sites prior to, during and after mining operations in Illinois.

Hydrogeologic investigations to determine site suitability for landfills, sewage sludge disposal, spray irrigation and industrial waste disposal.

Principal investigator on a dredge material disposal site feasibility study for Interstate Division for Baltimore City. This project was conducted to evaluate the feasibility of specific sites for disposal of 5 million cubic yards of

Professional Profile



Alison L. Dunn, P.G.

Registration

Registered Professional Geologist in the state of Virginia.

Fields of Competence

Groundwater flow system analysis and numerical modelling; groundwater contamination assessment and remediation; hydrogeologic evaluation of solid and hazardous waste sites; water supply and recovery well design and testing; monitor well network design and implementation; sampling of soil and water for conventional and hazardous chemical compounds.

Experience Summary

Three years experience as field hydrogeologist and project geologist in industrial and hazardous waste disposal site investigations including two Superfund sites, in IRP assessments of USAF facilities, and in inventories and assessments of various classes of injection wells. Three years of graduate research in hydraulic properties of shales and mudstones, watershed hydrology, and coastal hydrogeology, including practical applications of numerical groundwater flow models.

Credentials

B.A., Geology—Mount Holyoke College (1976)

M.S., Hydrogeology—University of Arizona (1981)

American Institute of Professional Geologists

National Water Well Association, Technical Division

American Geophysical Union, Hydrology Division

Employment History

1984-Present WESTON

1981-1984 SMC Martin, Inc.

1978-1981 University of Arizona,
Dept. of Hydrology
Environmental Research Lab
Office of Arid Land Studies

1978 (Summer)

Office of the State Geologist
Montpelier, VT

Key Projects

Field evaluation (IRP Phase II) of potential groundwater contamination at three Air Force Bases in California, including monitor well installation and sample collection, analysis of hydrogeologic and chemical data.

Site visit and record search (IRP Phase I) at an Air Force Facility in the Mid-Atlantic Region, site identification and report preparation.

Field evaluation of fuel in groundwater at a Gulf Coast Air Force Facility, including monitor well installation, collection and analysis of hydrologic data.

Site assessment and remediation at an uncontrolled hazardous waste disposal site in New Jersey, including field sampling of highly contaminated groundwater and soils, conceptual development of site remediation measures, and testing of remedial measures on a computer groundwater flow model.

Hydrogeologic investigation of a 50-acre site for impact of past electronic components manufacturing operations on ground-and surface water.

Evaluation of the effect of placing an innovative top seal for closure of a 25-acre municipal landfill, including analysis of long-term hydrogeologic and geochemical conditions.

Site assessment and remediation at an uncontrolled hazardous waste disposal site in Ohio including a metal detector survey for buried drums, soil sampling, drilling and well construction supervision, well logging, and data analysis.

Evaluation of surface seepage from a 3-acre wastewater lagoon, including water level monitoring and a detailed water budget.

Publications

"Trichloroethylene Occurrence and Ground-Water Restoration in Highly Anisotropic Bedrock: A Case Study." Co-author David L. Kraus, in Proceedings of the Third National Symposium and Exposition on Aquifer Restoration and Groundwater Monitoring, National Water Well Association, Columbus, OH, 1983.

Professional Profile



Deborah L. Jones

Fields of Competence

Field and laboratory soils investigations; analysis of soil characteristics and suitability for specific land use purposes, groundwater contamination detection investigations, soil erosion determination and control.

Experience Summary

Experience in soil and hydrogeological investigations including evaluation of soil erosion potential, field characterization of soils and evaluation for on-lot waste disposal, sanitary landfills, and sludge disposal; soil and groundwater sampling, soil mapping, pump test performance and analysis, geophysical surveys including use of magnetometer, ground-penetrating radar, and electromagnetic conductivity meter, air monitoring using organic vapor analyzer.

Credentials

B.S., Environmental Resource Management—Pennsylvania State University (1981)

M.S., Environmental Pollution Control, emphasis in Agronomy — Pennsylvania State University (1983)

American Society of Agronomy

Soil Science Society of America

Employment History

1983-Present	WESTON
1981-1983	Northeast Watershed Research Center USDA-ARS

Key Projects

Soil evaluation to determine site suitability for a hazardous waste disposal facility and assisted in preparation of variance request.

Soil suitability investigations for on-lot waste disposal in Chester County, PA.

Evaluation of soils to determine suitability as liner material for a hazardous waste landfill in Central Illinois.

Soils and hydrogeologic investigations to determine extent of fuel oil contamination at an Air Force Base in New York.

Intensive geophysical investigations to characterize a chemical waste disposal site for a government research firm in New Mexico.

Soil sampling and evaluation to determine extent of contamination at an industrial hazardous waste storage area in New Mexico.

Soils investigations to determine extent of pesticide contamination at a storage facility in Minnesota.

Literature search to determine state-of-the-art groundwater measurement and transport modelling techniques.

Publications

Rogowski, A.S., R.M. Khanbilvardi, and D.L. Jones. "Point Estimates of Erosion." For presentation at the 1984 summer meeting of American Society of Agricultural Engineering, University of Tennessee, Knoxville, TN, June 24-27, 1984.

Professional Profile

Wayne W. Brew

Fields of Competence

Supervision of drill rig operations and monitor well installation. Groundwater sampling and aquifer evaluation. Data collection and management. Geographic applications to data.

Experience Summary

Supervision of drill rig operations including exploratory drilling and monitor well installation. Geologic logging through cuttings and geophysical well logs including natural gamma, induced gamma, spontaneous-potential (SP) and resistivity. Monitor well sampling and groundwater level measurements. Exploratory field work and reconnaissance. Surveying locations, distances and elevations. Data collection and management.

Credentials

B.S., Earth Sciences (Geology)
The Pennsylvania State University (1980)

B.S., Geography
The Pennsylvania State University (1981)

On-going graduate course work (24 credits) in environmental geography.
Temple University (currently part-time status)

Employment

1984 - Present	WESTON
1983 - 1984	Container Corporation of America.
1981 - 1983	Temple University Library and Institute of Survey Research
1980 - 1981	Pennsylvania State University Coal Laboratory
1979 - (Summer)	W.R. Grace Company Mining and Exploration Division

Professional Profile

Bruce W. Benyish

Fields of Competence

Broad range of experience involving subsurface exploration programs, supervising the construction of monitoring and production wells, conducting sustained pump tests, hydrogeologic data analysis, and technical report preparation.

Credentials

B.S., Earth Science—Pennsylvania State University (1979)

National Water Well Association, Technical Division

Employment History

1983-Present	WESTON
1983	Suburban Water Testing Labs, Inc.
1980-1982	Gilbert/Commonwealth
1980	General Battery Corporation

Key Projects

Served as a field geologist at hazardous waste sites during the USAF Installation Restoration Programs. Responsibilities included supervision of the installation

of monitoring wells, procurement of representative soil samples for documentation, and collection of groundwater samples for analysis of various organic and inorganic chemical constituents. Participated in the preparation of Installation Restoration Program Reports.

Participated in the development of water well fields for municipal water supplies. Performed aerial photograph fracture trace analysis to assist in selecting optimum water well sites. Supervised sustained well pumping tests and analyzed data to determine safe yields. Prepared hydrogeologic reports incorporating pumping test data and geologic literature. Submitted reports to regulatory agencies to obtain groundwater withdrawal permits.

Supervised the drilling of foundation test borings and monitoring well installations pertaining to an Environmental Impact Assessment (EIA) feasibility study for a coal-fired power plant. Participated in the preparation of EIA Report.

Participated in water table aquifer decontamination programs. Scope of involvement included supervising the withdrawal of hazardous sludges from pre-existing wells, pumping, sampling, and treating contaminated groundwater, and scheduling shipment of non-treatable groundwater to certified waste disposal sites.

Professional Profile



John A. Williams, Jr.

Fields of Competence

Geologic and geophysical investigations; geological and groundwater sampling techniques and instrumentation technology; design, operation, and evaluation of geophysical survey, equipment, testing and analysis of aquifers, and groundwater pollution.

Experience Summary

Three years experience in geologic and geophysical investigations including subsurface profiling using Ground Penetrating Radar (GPR), electrical resistivity and electromagnetic conductivity for numerous private and government facilities; groundwater sampling and aquifer pump tests, six years experience in bathymetric, hydrographic and biological studies.

Credentials

A. S., Marine Technology - Cape Fear Technical Institute (1975)

B. S., Earth Science (Geology) - West Chester State College (1983)

Certified Ground Penetrating Radar Operator

Certified NAUI/PADDI Scuba Diver

Geological Society of America

Employment History

1982 - Present	WESTON
1980-1982	Environmental Resources Management, Inc.
1977-1980	WESTON
1976-1977	Highway Service Marineland
1975-1976	Lawler, Matusky, Skelly Engineers

Key Projects

Coordinated and supervised geophysical investigations to locate buried drums and to delineate the boundaries of a buried waste lagoon for a scrap recovery plant in Rhode Island.

Geophysical field investigation to locate buried trenches and waste lagoons for a government facility in California.

Geophysical field investigation, well installation and sample collection to determine the distribution of leachate, and the extent of contamination in a heavily-used aquifer in New York.

Geophysical investigation to define the lateral and vertical effect of fill deposition for a facility in Massachusetts.

Soils investigation to determine the extent of contamination from old waste lagoons and fire training areas for a government facility in Arizona.

Hydrogeologic investigation for a scrap recovery facility in western Pennsylvania.

Responsible for deploying benthic and water quality sampling gear and an electronic navigation system for a dredge spoils disposal study in Lake Erie.

Geophysical investigation (ground penetrating radar and electrical resistivity) to locate buried drums and delineate trench boundaries for a government facility in Ohio.

Professional Profile



David Ben-Hur, Ph.D.

Fields of Competence

Analytical laboratory management. Project Management. Analytical chemistry, physical organic chemistry, photochemistry. Separation and detection techniques. Development and adaptation of analytical protocols for complex mixtures. Analytical solutions to industrial and environmental problems. Quality control. Combustion and incineration phenomena.

Experience Summary

Twenty years experience as a senior chemist and project director in solving non-routine chemical analytical problems. Ten years experience in management and supervision of chemists and analytical groups involved in environmental problems, toxic and hazardous wastes, failure analysis, pre- and post-explosion detection and identification of explosive materials. Studies of combustion and pyrolytic processes in excess air and in closed ecological systems. Development of compatibility criteria for blending hazardous wastes for disposal by incineration. Development of analytical protocols for the analyses of major, minor, and trace components of complex and diverse mixtures. Development of quick-response laboratory for hazardous wastes shipment analyses.

Credentials

B.S., Chemistry—University of Southern California, Los Angeles (1959)

M.S., Physical Chemistry—University of California, Los Angeles (1961)

Ph.D., Physical Organic Chemistry—University of California, Los Angeles (1969)

American Chemical Society

Sigma Xi

Phi Beta Kappa

Employment History

1983-Present	WESTON
1982-1983	At-Sea Incineration, Inc.
1979-1982	Jacobs Engineering Group, Inc.

1977-1979

Alcon Optic

1970-1977

Analytical Research Laboratories, Inc.

1964-1970

Astrophysics Research Corporation

Key Projects

Directed personnel for four years in the sampling and analysis of water, soil, sludge, tissue, and synthetic mixtures to determine nature and concentration of hazardous materials in support of Federal, State, and regional regulatory agencies.

Developed analytical protocol and laboratory requirements for quick-turn-around analysis of concentrated hazardous wastes for disposal purposes.

Developed criteria for compatibility of hazardous wastes of diverse industrial origins.

Directed the development and compilation of manuals of available methods for sampling and analysis of totally unknown mixtures.

Directed studies on the removal of organic contaminants from water by activated carbon treatment and by ozonolysis, including kinetics and degradation product determination.

Directed research aimed at determining the causes of discoloration in hydroxyethyl methacrylate polymers used in soft lens manufacturing, and developed methods for clean-up and future prevention of such discolorations.

Developed methods for controlling the polymerization process in the preparation of acrylic polymers for lens use.

Conducted research into the products of oxygen-poor and oxygen-rich combustion of synthetic mixtures in support of NASA space missions and the Navy.

Developed procedures for the analysis of explosive residues in support of law enforcement authorities.

Involved in theoretical space research studies of non-equilibrium ionospheric interaction with missile plumes, effects of solar radiation on the ionosphere.

Studies of off-axis infrared laser detection.

Professional Profile

Margaret Neckels

Fields of Competence

Supervision and sampling of groundwater, surface water, wastewater, soils and air; chain of custody protocols; operation, calibration and maintenance of field sampling and analytical equipment; data collection and maintenance of groundwater flow and level monitors. Laboratory analysis of water, soils and gases ranging from wet chemistry to automated instrumental methods. Shipping and receiving of environmental and hazardous samples.

Experience Summary

Nine years laboratory and field experience including environmental water sampling, soils sampling and air pollution testing. Experience in developing and fabricating equipment for groundwater sampling. Analytical laboratory experience in water, wastewater, soils and air analysis. Experience in coordinating field equipment and supplies and a variety of projects ranging from groundwater and soil sampling to air pollution testing.

Credentials

B.A., Physical Education—California State College, Stanislaus (1976)

Courses in Biosciences, Chemistry and Geology

Employment History

1983-Present	WESTON
1978-1983	Occidental Chemical Company
1976-1978	Valley Nitrogen Producers

Key Projects

Responsible for sampling and monitoring of Occidental Chemical's 65 groundwater wells. Sampling and monitoring of related groundwater treatment plant. Monitoring of the groundwater extraction system to evaluate effectiveness of groundwater control strategy.

Initiated and supervised surface water and sediment sampling in Arizona for the Army Corps of Engineers. Conducted laboratory analysis for these samples.

Started up and maintained inorganics laboratory including atomic absorption colorimetric instrumentation, and wet chemistry methods.

Conducted air monitoring of particulates for hazardous soil excavation program.

Supervised sampling and monitoring of production and groundwater wells at Beale, Castle, Luke, Mather, Norton, and Travis Air Force Bases. Coordinated field technicians, equipment and supplies for these sampling efforts.

Supervised and coordinated sampling of domestic housing wells surrounding Sharpe Army Depot, Lathrop, California.

Professional Profile



Joseph R. Althouse

Fields of Competence

Data collection; wastewater sampling; flow measurement in house treatability systems; analytical methods in wet laboratory; air pollution testing; maintenance of laboratory and field equipment for field projects; infiltration and inflow programs; construction estimating; quantity take-off; pricing; and on-site sewer construction inspection.

Experience Summary

Eight years experience in coordinating field equipment and supplies on various projects ranging from stream surveys to air pollution testing. Experience in developing and fabricating equipment for wastewater sampling. Sampling technician for infiltration/inflow studies, fish bioassays; air pollution, and wastewater sampling, construction estimating and on-site construction inspection.

Employment History

1980-Present	WESTON
1979-1980	Charles E. Moore Associates
1974-1979	Rexnord Instrument Products
1967-1974	WESTON
1965-1967	Lukens Steel Company
1963-1965	Firestone Tire and Rubber Company

Key Projects

Sewer construction inspection for West Whiteland Township, Pennsylvania.

Infiltration/inflow analyses and sewer system evaluation studies, including surface inspection, physical inspection and flow measurements for a township.

Source emissions and ambient air testing of air pollutants.

Wastewater survey of a major steel producing plant in Texas including collecting flow data and wastewater samples and constructing and maintaining test equipment.

Wastewater survey of 2 major electric power companies in Pennsylvania collecting flow data and wastewater samples for National Pollution Discharge Elimination System.

Professional Profile

APPENDIX D

WELL LOGS AND WELL
CONSTRUCTION DETAILS

D.1 MONITOR WELLS



DRILLING LOG

WELL NUMBER: MW 210 OWNER: USAF
LOCATION: _____ ADDRESS: Castle AFB

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE _____
DRILLER: _____ HELPER: _____
LOG BY: _____

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40				
0				
50				
0				
60				
0	60	- 69		Brown medium SAND
70				
0	69	- 85		Brown medium SAND, with some fine to medium GRAVEL and trace gold mica chips (hard drilling)
80				



DRILLING LOG

WELL NUMBER: MW 210 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE _____
DRILLER: _____ HELPER: _____
LOG BY: _____

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/MNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
80	0			
	85	-	92	Brown variegated coarse SAND and fine to medium GRAVEL w/trace CLAY lenses (hard drilling)
90				
	0	92	- 120	Reddish-brown CLAY w/some fine SAND
100	0			
	0			
110	0			
	0			
120				END OF DRILLING

* ASTM D1586

MW-210

Top of Casing El.

167.62'

Ground Surface

BGS 33.6'

Grout Seal

BGS 41.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 89.25'

Cuttings and/or Sand

BGS 120'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 220 OWNER: USAF
LOCATION: Base Produc- ADDRESS: Castle AFB
tion Wells/Bldg 752
TOTAL DEPTH 100'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING Mud DATE 10/24/
COMPANY: Stang METHOD: Rotary DRILLED: 1984
DRILLER: Burt Schwartz HELPER: _____

LOG BY: WWB

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	- 8	Light brown fine to medium SAND with SILT
0			
0			
10	8	- 10	Reddish-brown iron-silicate cemented fine SAND
0	10	- 18	Very SILTY CLAY with some SAND
20	18	- 20	Reddish-brown iron-silicate cemented fine SAND
	20	- 37	Green-gray CLAY w/some SILT and trace fine SAND
0			
30			
0			
0	37	- 63	Variegated coarse angular SAND w/some fine SAND and SILT
40			

MW-220

Top of Casing El.

166.18'

Ground Surface

BGS 39.1'

Grout Seal

BGS 43.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 88.79'

Cuttings and/or Sand

BGS 100'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 230 OWNER: USAF
LOCATION: SLFZ-LF 1 ADDRESS: Castle AFB
TOTAL DEPTH 105'
SURFACE ELEVATION: _____ WATER LEVEL: _____
Mud
DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE 10/31/84
DRILLER: T.R. HELPER: _____

LOG BY: DLJ/WWB

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	- 10	Light brown fine to medium SAND w/some CLAY & SILT
0			
10	10	- 16	Light brown compacted fine SAND and SILT
	16	- 23	Light brown SILTY CLAY w/some coarse quartz SAND
20	23	- 31	Olive-green CLAY and coarse variegated SAND
	31	- 74	Coarse variegated SAND with some olive green CLAY interbedded
30			
40			

MW-230

Top of Casing El.

174.16'

Ground Surface

BGS 44.4'

Grout Seal

BGS 48.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 94.01'

Cuttings and/or Sand

BGS 105'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 240 OWNER: USAF
LOCATION: SLEZ-LF 2 ADDRESS: Castle AFB

TOTAL DEPTH 110'
SURFACE ELEVATION: _____ WATER LEVEL: _____
Mud
DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE DRILLED: 11/1/84
DRILLER: BS HELPER: _____
LOG BY: WVB

NOTES:

DEPTH (FEET)	O/A/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	7	Dark-brown very SANDY CLAY
10	0	7	67	Variegated coarse SAND w/some fine to medium SAND and trace brown CLAY (lenses)
20	0			
30	0			
40	0			

* A.S.T.M. D1586



DRILLING LOG

WELL NUMBER: MW 240 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WWR

SKETCH MAP

NOTES:

DEPTH (FEET)		OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40					
	0				
50	0				
	0				
60	0				
	0	67	-	70	Variegated, well rounded, medium to coarse GRAVEL (hard drilling).
70					
		70	-	94	Variegated coarse SAND
	0				
80	0				

MW-240

Top of Casing El.

167.64'

Ground Surface

BGS 44.9'

Grout Seal

BGS 49.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 94.58'

Cuttings and/or Sand

BGS 112'



DRILLING LOG

WELL NUMBER: MW 250 OWNER: USAF
LOCATION: SLEZ-LF 1 ADDRESS: Castle AFB
TOTAL DEPTH: 105'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE: 10/29/
DRILLER: Trace Rankin HELPER: _____

LOG BY: DLJ/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	1	Dark brown fine SAND with some SILT
	1	-	3	Yellowish brown fine to medium dry friable SAND
0	3	-	10	Yellowish-brown medium to coarse SAND
10	10	-	15	Interbedded grayish-brown CLAY and some fine SAND
	15	-	24	Brown CLAY w/trace SILT and SAND
20				
	24	-	28	Yellowish-brown CLAY w/some SILT and mottled w/trace orange SILT
30	28	-	47	Variegated coarse SAND with some fine GRAVEL and trace medium gold mica
40				



DRILLING LOG

WELL NUMBER: MW 250 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE _____
DRILLER: _____ HELPER: _____
LOG BY: DLJ/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40			
0			
47	-	60	Interbedded brown CLAY and some tan coarse SAND
50			
0			
0			
60			
0			
60	-	70	Brown coarse variegated SAND
70			
0			
70	-	95	Variegated coarse SAND and medium GRAVEL (hard drilling)
80			
0			



WELL NUMBER: MW-250 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE
DRILLER: _____ DRILLED: _____
HELPER: _____
LOG BY: DLJ/WWB

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
80			
90			
95 - 99	-		Coarse variegated SAND with trace CLAY
99 - 105	-		Tan CLAY with some sand
105			END OF DRILLING

MW-250

Top of Casing El.

171.01'

Ground Surface

Grout Seal

BGS 42.7'

Bentonite Seal

BGS 47.0'

Riser

Sand Pack

Screen

BGS 92.38'

Cuttings and/or Sand

BGS 105'



SKETCH MAP

DRILLING LOG

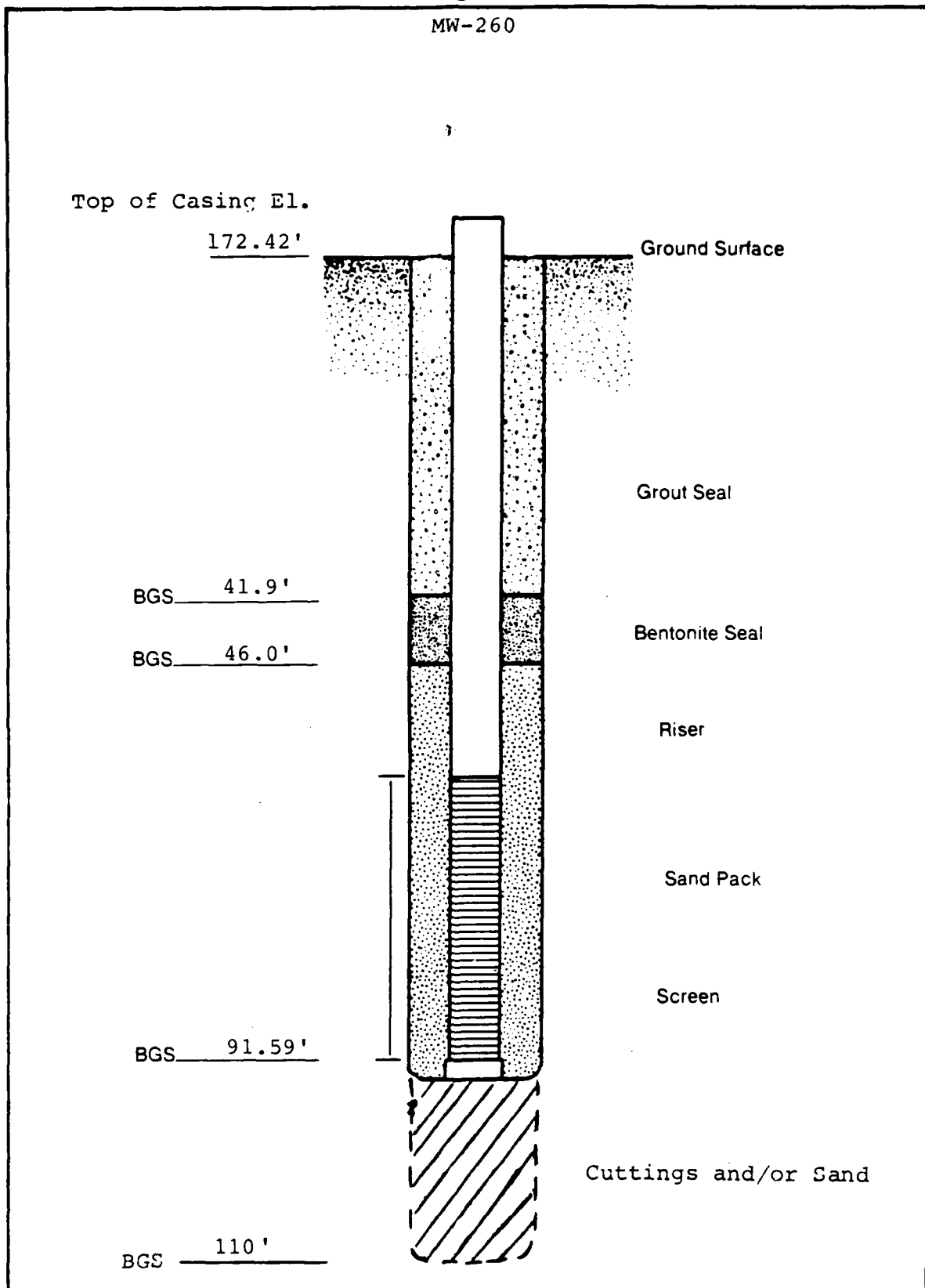
WELL NUMBER: MW 260 OWNER: USAF
LOCATION: SLFZ-LF 1 ADDRESS: Castle AFB
TOTAL DEPTH: 110'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING Mud DATE 10/27/
METHOD: Rotary DRILLED: 1984
DRILLER: BS HELPER: _____
LOG BY: WVB

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	3	Light brown fine SAND with some SILT
	3	-	14	Reddish-brown fine SAND with some SILT and trace fine quartz gravel
10				
	14	-	20	Brown silty CLAY
20				
	20	-	36	Coarse variegated SAND with trace CLAY
30				
	36	-	68	Variegated coarse SAND and fine GRAVEL with some brown CLAY
40				

* ASTM D1586

MW-260





SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 270 OWNER: USAF
LOCATION: SLEZ - LF 2 ADDRESS: Castle AFB
Bldg 949
TOTAL DEPTH 105'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING Mud DATE 11/05/
COMPANY: Stang METHOD: Rotary DRILLED: 1984
DRILLER: T.R. HELPER: _____

LOG BY: BWB/WWB

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	10	Orange-brown SILTY fine SAND
10				
	10	-	15	Brown SILTY fine SAND w/some CLAYEY SILT lenses
	15	-	23	Light gray-brown CLAY (laminated)
20				
	23	-	28	Brown fine to medium SAND with some trace coarse quartz SAND
	28	-	43	Brown SILTY CLAY with trace coarse SAND
30				
40				



DRILLING LOG

WELL NUMBER: MW 270 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: BWB/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40			
0	43	- 60	Brown CLAY with some medium to coarse SAND
50	0		
	0		
60	0		
0	60	- 73	Variegated fine to coarse SAND micaceous
	0		
70	0		
0	73	- 88	Variegated fine to coarse SAND and variegated fine to medium GRAVEL (sub-angular) (hard drilling)
80	0		

MW-270

Top of Casing El.

170.56'

Ground Surface

BGS 38.0'

Grout Seal

BGS 42.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 88.93'

Cuttings and/or Sand

BGS 105'



DRILLING LOG

WELL NUMBER: MW 280 OWNER: USAF
LOCATION: SLEZ-LF 2 ADDRESS: Castle AFB
TOTAL DEPTH: 100'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING Mud DATE 11/02/84
COMPANY: Stang METHOD: Rotary DRILLED: _____
DRILLER: T.R. HELPER: _____
LOG BY: BWB/WWB

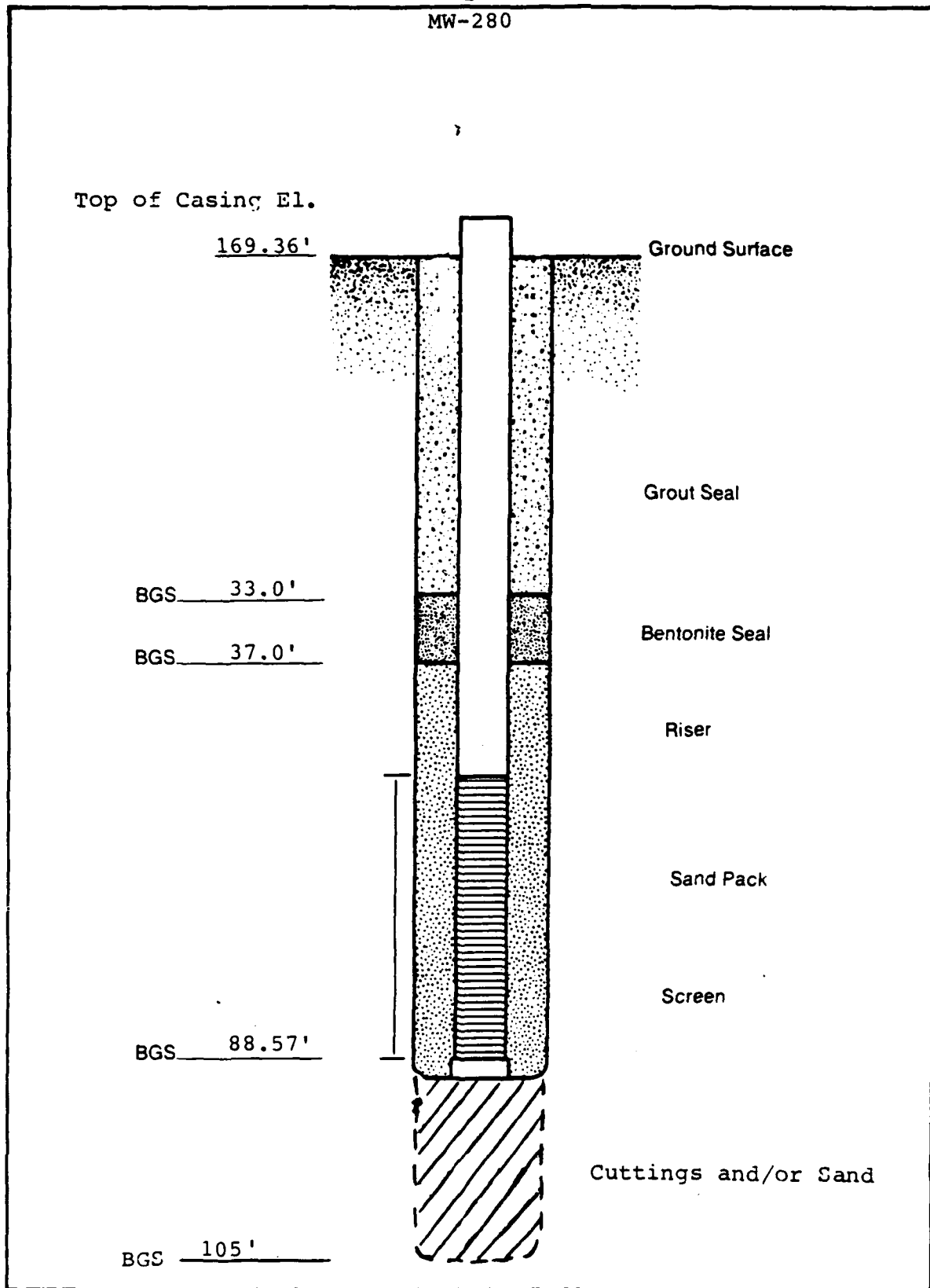
SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	- 4	Reddish-brown SILTY fine SAND (friable)
4	4	- 10	Brown SILTY fine SAND
10	10	- 28	Brown fine to medium SAND
28	28	- 56	Brown fine to medium SAND w/some coarse variegated SAND
40			

WESTON

MW-280





DRILLING LOG

WELL NUMBER: MW 290
LOCATION: Bldg. 1550

OWNER: USAF
ADDRESS: Castle AFB

SURFACE ELEVATION: _____

TOTAL DEPTH 95'

DRILLING COMPANY: Stang
DRILLER: BS

DRILLING METHOD: Rotary
Mud DATE
DRILLED: 11/5/84
HELPER: _____

LOG BY: ALD/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU			INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	6		Reddish-brown SILTY fine to medium SAND
	0	-	8		Tan cemented SANDY SILT
	8	-	15		Reddish-brown SANDY SILT
10					
	0	-	20		Greenish-tan SILTY CLAY
20	0	-	39		Greenish-tan SILTY CLAY
					interbedded with some layers
	0				of red-brown SILT
30	0				
	0				
40					



DRILLING LOG

WELL NUMBER: MW 290 OWNER: _____
LOCATION: _____ ADDRESS: _____

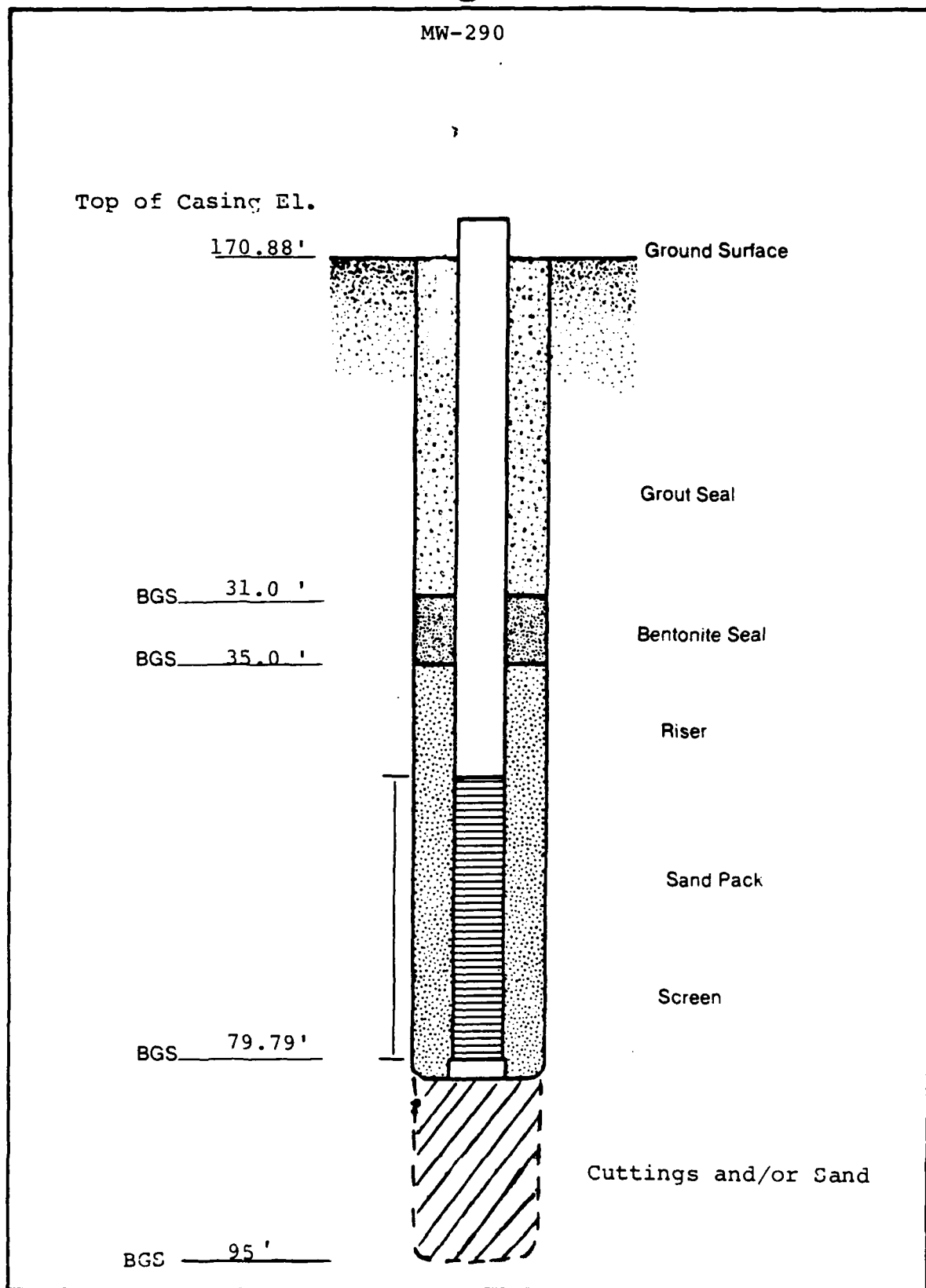
TOTAL DEPTH: _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: ALD/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)		OVA/HNU		INTERVAL (FEET)		DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40		39	-	42		Variegated medium SAND interlayered with some red SILT and green CLAY
	0					
		42	-	61		Green CLAY (plastic) with trace red SILT
	0					
50						
	0					
		61	-	78		Variegated medium to coarse SAND and fine GRAVEL (rounded) (moderately hard drilling)
	0					
60						
	0					
70						
	0					
80						

MW-290





DRILLING LOG

WELL NUMBER: MW 300 A OWNER: USAF
LOCATION: Bldg. 1548 ADDRESS: Castle AFB
TOTAL DEPTH 75'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING Mud DATE
METHOD: Rotary DRILLED: 11/7/84
DRILLER: B.S. HELPER: _____
LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	- 15	Gray-brown SILTY fine to coarse SAND
10	0		
15	15	- 19	Yellow-brown SILTY fine to medium SAND (hard pan)
20	0		
25	19	- 28	Variegated coarse SAND
30	0		
35	28	- 62	Olive-green CLAY with some interlayered coarse variegated SAND
40	0		



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 300 OWNER: USAF
LOCATION: Bldg 1536 ADDRESS: Castle AFB
TOTAL DEPTH: 100'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING METHOD: Mud Rotary DATE: 12/3/84
DRILLER: B.S. HELPER: _____
LOG BY: WWR

NOTES:

DEPTH (FEET)	O.V.A./H.N.U.		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	12	Brown fine to medium SAND with some SILT (fill material)
10	0			
	12	-	17	Olive-green SILTY CLAY with trace coarse SAND
20	0	17	- 28	Brown SILTY coarse SAND with some fine to medium SAND
	0			
30		28	- 34	Olive-green CLAY with some SILT
	0	34	- 42	Variegated coarse SAND with some fine SAND
40	0			



DRILLING LOG

WELL NUMBER: MW 300

OWNER: _____

LOCATION: _____

ADDRESS: _____

TOTAL DEPTH: _____

SURFACE ELEVATION: _____

WATER LEVEL: _____

DRILLING

COMPANY: _____

DRILLING

METHOD: _____

DATE

DRILLER: _____

HELPER: _____

LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40			
	42	- 46	Variegated coarse SAND with some fine to medium variegated GRAVEL
0			
	46	- 55	Variegated coarse SAND with some olive-green clay (interbedded)
50			
0			
	55	- 71	Variegated coarse SAND
0			
60			
0			
70			
0			
	71	- 78	Variegated coarse SAND with some fine to coarse GRAVEL
0			
0	78	- 83	Coarse GRAVEL in SILTY fine SAND (matrix) (hard drilling)
80			

MW-300

Top of Casing El.

172.81'

Ground Surface

BGS 41.6'

Grout Seal

BGS 46.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 91.21'

Cuttings and/or Sand

BGS 100'



SKETCH MAP

DRILLING LOGWELL NUMBER: MW 310 OWNER: USAFLOCATION: Bldg. 1532 ADDRESS: Castle AFBTOTAL DEPTH: 105'

SURFACE ELEVATION: _____ WATER LEVEL: _____

DRILLING COMPANY: Stang DRILLING METHOD: Mud Rotary DATE DRILLED: 11/14/84DRILLER: T.R. HELPER: _____LOG BY: BWB/WWB

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	C	0	- 4	Tan fine to medium SAND with some SILT
		4	- 8	Reddish-brown iron-silicate cemented SAND with some SILT (hard pan)
10	0	8	- 18	Reddish-brown fine to coarse SAND with trace SILT (lenses)
20	0	18	- 32	Olive-gray CLAY (low to medium plastic) with some fine SAND (lenses)
30	0	32	- 52	Olive-gray CLAY (medium to high plastic) with some reddish-brown SILTY SAND (lenses)
40	0			



DRILLING LOG

WELL NUMBER: MW 310 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: BWB/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40			
0			
50			
0			
	52	- 67	Variegated fine to coarse SAND with some olive-gray CLAY (lenses)
0			
60			
0			
0	67	- 70	Variegated fine to coarse SAND with some medium GRAVEL
70			
0	70	- 80	Variegated fine to medium GRAVEL and medium to coarse SAND (hard drilling)
80			
0			

MW-310

Top of Casing El.

168.88'

Ground Surface

BGS 38.0'

Grout Seal

BGS 42.0'

Bentonite Seal

Riser

BGS 87.35'

Sand Pack

Screen

BGS 105'

Cuttings and/or Sand



DRILLING LOG

WELL NUMBER: MW 320 OWNER: USAF
LOCATION: ELFZ- FT 1 ADDRESS: Castle AFB
Bldg 1888
TOTAL DEPTH 105'
SURFACE ELEVATION: _____ WATER LEVEL: _____
Mud
DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE DRILLED: 11/8/84
DRILLER: T.R. HELPER: _____
LOG BY: BWB/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	2	Brown SILTY fine SAND
	2	-	3	Brown SILT and fine SAND compacted and cemented (very hard) hardpan
	0	-	8	Brown SILTY fine SAND with some cemented lenses
10	8	-	15	Olive gray SILT with some fine to medium compacted SAND (lenses)
	0	-	23	Yellow-brown SILT with some fine SAND
20	0	-	33	Reddish-brown SILT with some CLAY and fine to medium SAND
	0	-	38	Olive-gray CLAY with some brown SILT and fine SAND
30	0	-	43	Olive-gray SILTY fine SAND
40	38	-	43	



DRILLING LOG

WELL NUMBER: MW 320 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE _____
DRILLER: _____ HELPER: _____
LOG BY: BWB/WWB

SKETCH MAP

NOTES:

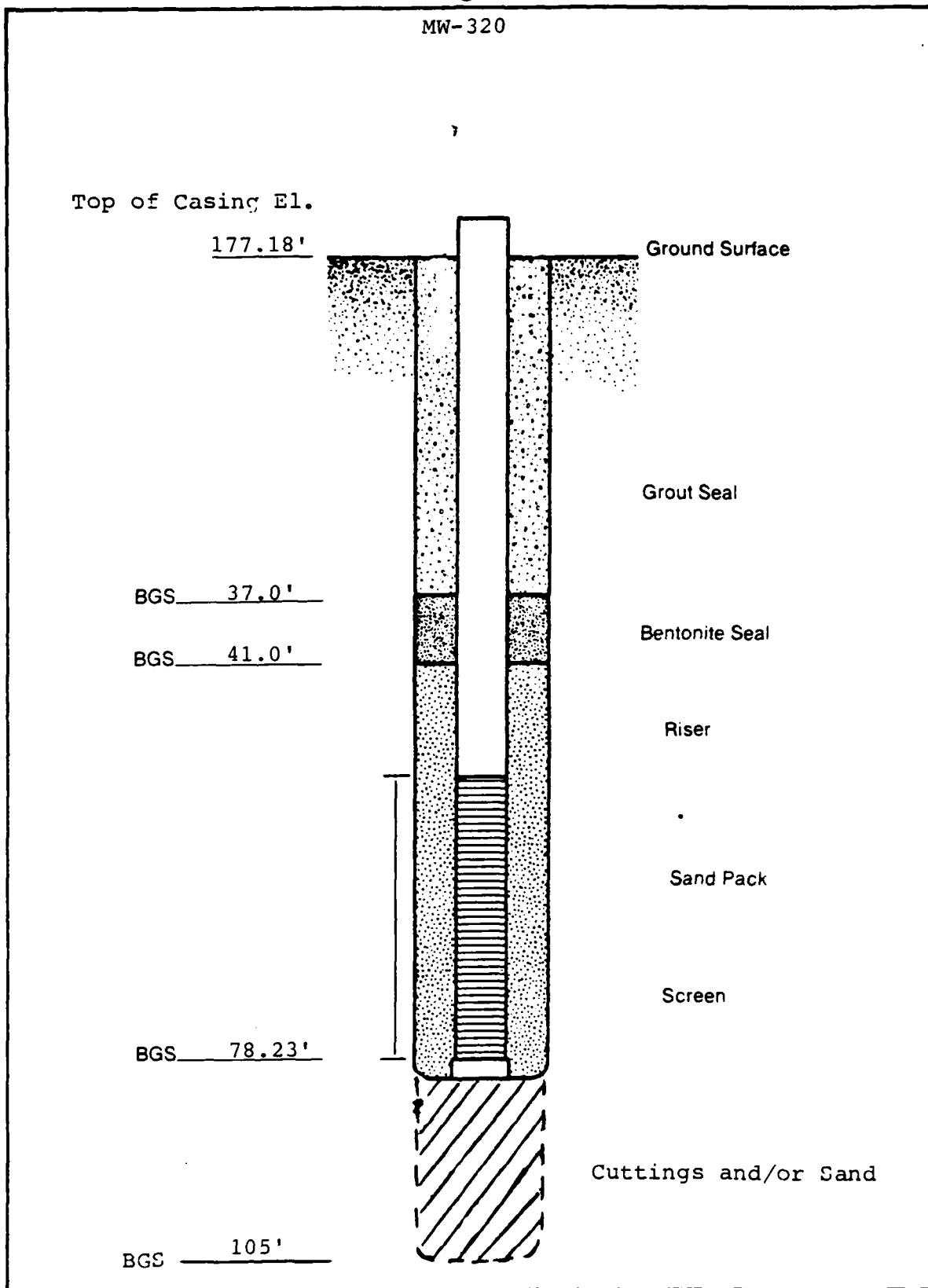
DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40			
0	43	- 48	Light gray CLAY with some SILT and trace fine SAND
50	0	48 - 65	White fine to coarse quartz SAND
	0		
60	0		
	65	- 73	Olive-gray SILT with some fine SAND
	0		
70			
	0	73 - 78	Olive-gray CLAY with some SILT
80	0	78 - 80	White medium to coarse quartz SAND

* A.S.T.M. D1586

D-48

SHEET 2 OF 3

MW-320





DRILLING LOG

WELL NUMBER: MW 330 OWNER: USAF
LOCATION: ELFZ-FT 1 ADDRESS: Castle AFB
Bldg 1712
TOTAL DEPTH: 100'
SURFACE ELEVATION: _____ WATER LEVEL: _____
Mud
DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE: 11/10/84
DRILLER: B.S. HELPER: _____

LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)		OVA/HNU		INTERVAL (FEET)		DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	0	-	2		Brown SANDY, SILTY CLAY
		2	-	4		Reddish-brown iron silicate fine cemented SAND (very hard) with white CLAY interbedded
	0	4	-	8		Reddish-brown SANDY CLAY
10		8	-	12		Reddish-brown CLAY with some coarse SAND
	0	12	-	17		Tan coarse quartz SAND (angular) with trace CLAY
20	0	17	-	32		Yellow-brown coarse quartz SAND with SILT
	0					
30						
	0	32	-	38		Yellow-brown CLAY with SILT and some coarse SAND
	0					
40		38	-	54		Yellow-brown variegated coarse SAND with trace fine GRAVEL

ASTM D1586

AD-A168 226

INSTALLATION RESTORATION PROGRAM PHASE II
CONFIRMATION/QUANTIFICATION STA. (U) WESTON (ROY F) INC
WEST CHESTER PA A L DUNN ET AL. 28 JUN 85

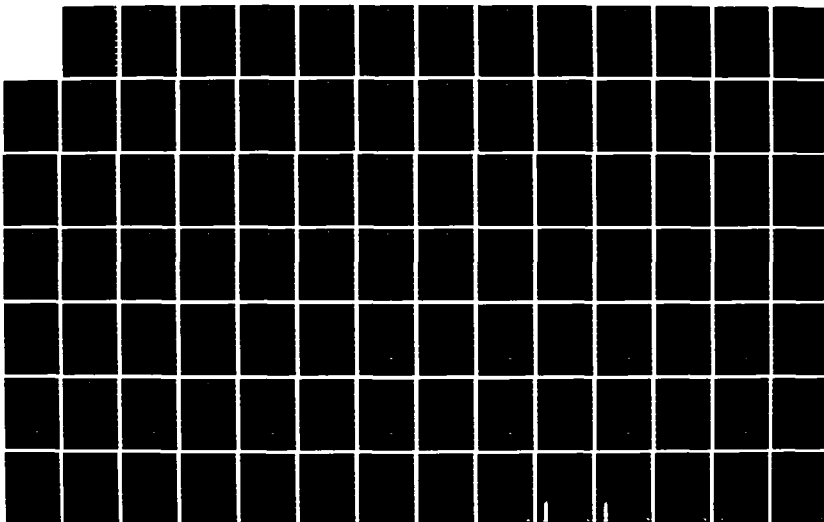
2/3

UNCLASSIFIED

F33615-84-D-4400

F/G 13/2

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

MW-330

Top of Casing El.

176.47'

Ground Surface

BGS 28.0'

Grout Seal

BGS 32.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 80.68'

Cuttings and/or Sand

BGS 100'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 340 OWNER: USAF
LOCATION: FLFZ-ET 1 ADDRESS: Castle AFB

TOTAL DEPTH 105'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING Mud DATE
COMPANY: Stang METHOD: Rotary DRILLED: 11/10/8
DRILLER: T.R. HELPER: _____
LOG BY: WWB

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	3	Light brown SILTY fine to medium SAND
	3	-	9	Reddish-brown iron-silicate fine to medium cemented SAND (hard pan)
10	9	-	21	White coarse quartz SAND (angular) with some SILTY brown CLAY
20	21	-	28	Yellow-brown CLAY with trace coarse quartz SAND
30	28	-	38	Variegated coarse SAND and olive-gray CLAY (Interbedded lenses)
40	38	-	47	Variegated coarse SAND with some fine SAND

* ASTM D1586



DRILLING LOG

WELL NUMBER: MW 340 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH: _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WVB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40				
0				
	47	-	56	Variegated coarse SAND with some SILTY CLAY (lenses)
50				
0				
0	56	-	78	Variegated coarse SAND
60				
0				
0				
70				
0				
0				
	78	-	84	Variegated coarse SAND with some SILTY CLAY (lenses)
80				
0				

MW-340

Top of Casing El.

177.29'

Ground Surface

BGS 28.0'

Grout Seal

BGS 32.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 81.24'

Cuttings and/or Sand

BGS 105'



DRILLING LOG

WELL NUMBER: MW 350 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH: _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: BWB/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)		INTERVAL (FEET)		DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40				
0				
50				
0				
60				
0				
70				
0				
80				

* ASTM D1586

D-60

SHEET 2 OF 3

MW-350

Top of Casing El.

183.88'

Ground Surface

BGS 30.5'

Grout Seal

BGS 35.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 89.71'

Cuttings and/or Sand

BGS 120'



SKETCH MAP

DRILLING LOGWELL NUMBER: MW 360 OWNER: USAFLOCATION: NLFZ - LF-5 ADDRESS: Castle AFBTOTAL DEPTH 105'

SURFACE ELEVATION: _____ WATER LEVEL: _____

DRILLING COMPANY: Stang DRILLING METHOD: Mud Rotary DATE 11/13/84DRILLER: T.R. HELPER: _____LOG BY: BWB/WWB

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	2	Tan fine SANDY SILT
	2	-	6	Reddish-brown fine SANDY SILT (compacted)
	6	-	13	Reddish-brown fine to medium SAND with some SILT (cemented)
10				
	13	-	30	Olive-brown fine SANDY SILT with trace CLAY
20				
30				
	30	-	38	Light gray CLAY (medium plastic)
40				
	38	-	45	Light gray SILTY CLAY

* ASTM D1586



SKETCH MAP

DRILLING LOGWELL NUMBER: MW 360

OWNER: _____

LOCATION: _____

ADDRESS: _____

SURFACE ELEVATION: _____

TOTAL DEPTH: _____

SURFACE ELEVATION: _____

WATER LEVEL: _____

DRILLING
COMPANY: _____DRILLING
METHOD: _____

DATE

DRILLED: _____

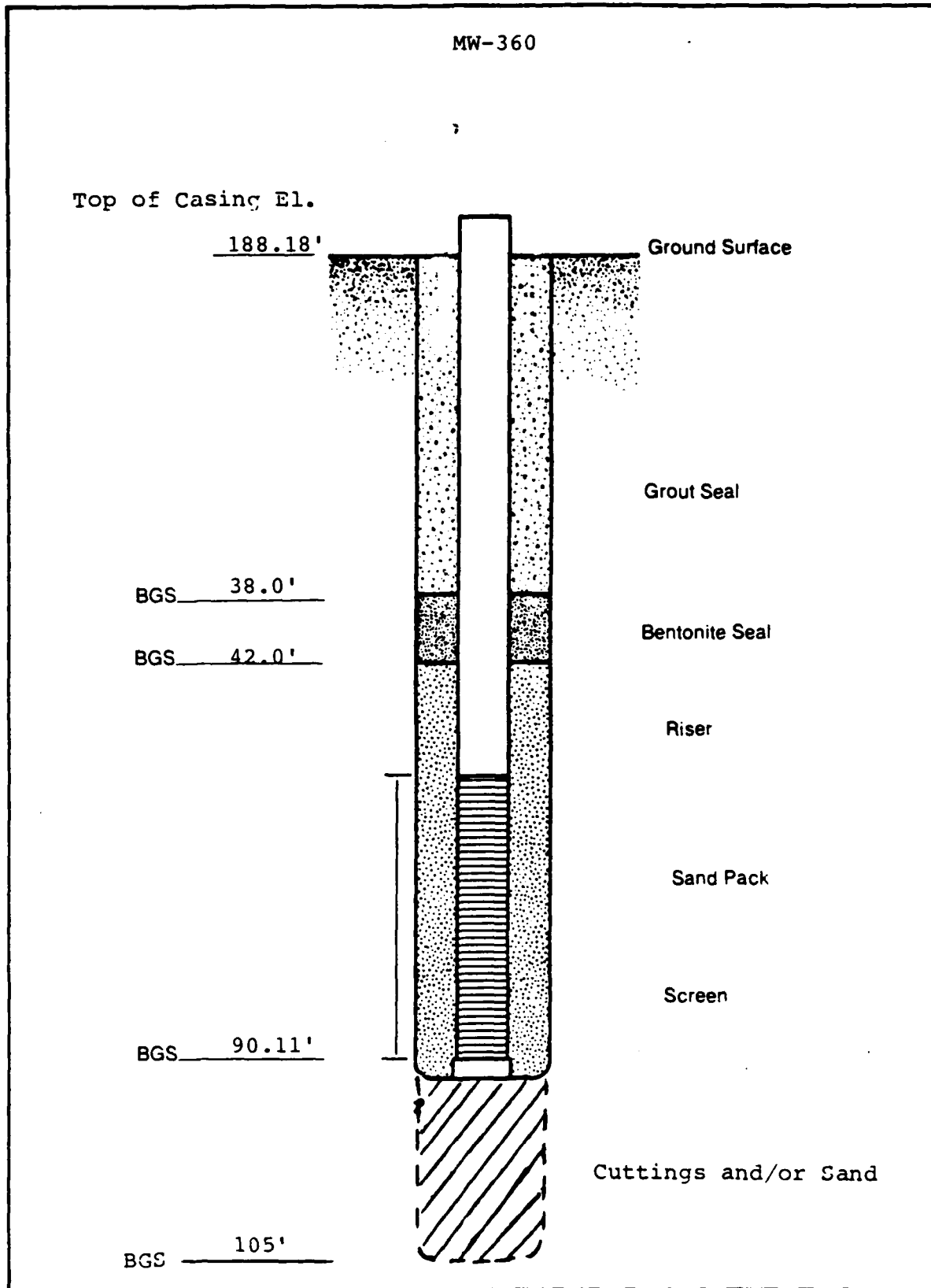
DRILLER: _____

HELPER: _____

LOG BY: BWB/WWBNOTES:

DEPTH (FEET)		OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40					
	0				
		45	-	49	Tan CLAY with some SILT
50	0	49	-	58	Olive-brown CLAY with some SILT and reddish-brown fine SAND
	0				
60		58	-	60	Brown SANDY CLAY
	0	60	-	73	Variegated medium to coarse SAND
	0				
70					
	0	73	-	83	Brown medium to coarse SAND
80	0				

MW-360





SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 370 OWNER: USAF
LOCATION: NLEZ - LF 5 ADDRESS: Castle AFB

TOTAL DEPTH 105'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING Mud DATE
METHOD: Rotary DRILLED: 11/14/84
DRILLER: BS HELPER: _____
LOG BY: WWB

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	2	Light brown fine SAND with SILT and CLAY and trace coarse GRAVEL
	2	-	5	Brown CLAYEY fine SAND
0	5	-	7	Reddish-brown compacted fine to medium SAND with some CLAY
10	7	-	13	Yellow reddish-brown fine SAND with SILT and CLAY
	13	-	32	Yellow olive-gray SILTY CLAY w/some variegated coarse SAND and fine GRAVEL
20	0			
	0			
30	0			
	32	-	38	Variegated coarse SAND and fine gravel
	0			
40	38	-	41	Olive gray CLAY w/trace variegated coarse SAND

* A.S.T.M. D1586

D-67

SHEET 1 OF 3



DRILLING LOG

WELL NUMBER: MW 370 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40	41	-	59	Olive gray CLAY and variegated coarse SAND (interlayered)
0				
50	0			
60	59	-	93	Variegated coarse SAND with some fine SAND and SILT
0				
70	0			
80	0			

ASTM D1586



WELL NUMBER: MW 370

OWNER: _____

LOCATION: _____

ADDRESS: _____

TOTAL DEPTH _____

SURFACE ELEVATION: _____

WATER LEVEL: _____

DRILLING COMPANY: _____ DRILL METE _____

DRILLING METHOD:

DATE _____

DRILLER: _____

METHOD: _____ **DATE DRILLED:** _____

DRILLED: _____

HELPER: _____

LOG BY: WWB

NOTES:

• A.S.T.M. D1500

MW-370

Top of Casing El.

192.43'

Ground Surface

BGS 37.0'

Grout Seal

BGS 41.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 95.26'

Cuttings and/or Sand

BGS 105'



SKETCH MAP

DRILLING LOGWELL NUMBER: WM 380 OWNER: USAFLOCATION: NLEZ - LF 5 ADDRESS: Castle AFBTOTAL DEPTH 110'

SURFACE ELEVATION: _____ WATER LEVEL: _____

DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE 11/15/84DRILLER: B.S. HELPER: _____LOG BY: ALD/WWB

NOTES:

DEPTH (FEET)	OVA/HNU			INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	2		Brown fine to medium SANDY SILT
	2	-	6		Reddish brown iron-silicate SILTY fine SAND (hard pan)
	6	-	20		Reddish brown fine SANDY SILT
10					
	0				
20	0				
	20	-	36		Tan SILTY CLAY with some fine SAND (friable)
	0				
30	0				
	36	-	45		Tan SILT (partially cemented) with some medium to coarse SAND
40	0				



DRILLING LOG

WELL NUMBER: MW 380 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH: _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: ALD/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	DATA		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
	DATA	DATA		
40				
	0			
	45	-	50	Olive-gray CLAY (medium to highly plastic)
50	0			
	50	-	64	Brown fine SANDY SILTY CLAY with some medium SAND
	0			
60	0			
	64	-	73	Brown CLAY with some variegated medium SAND
	0			
70	0			
	73	-	94	Variegated fine to coarse SAND with little olive-gray CLAY (lenses) and trace fine GRAVEL
	0			
80	0			

MW-380

Top of Casing El.

196.94'

Ground Surface

Grout Seal

BGS 42.0'

Bentonite Seal

BGS 46.0'

Riser

Sand Pack

Screen

BGS 92.28'

Cuttings and/or Sand

BGS 110'



DRILLING LOG

WELL NUMBER: MW 390 OWNER: USAF
LOCATION: WLFZ LF-4 ADDRESS: Castle AFB

TOTAL DEPTH 120'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING Mud DATE
METHOD: Rotary DRILLED 11/30/84
DRILLER: B.S. HELPER: _____
LOG BY: WWR

SKETCH MAP

NOTES:

DEPTH (FEET)	O/A/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	9	Brown fine to medium SAND with some CLAY and trace SILT
10	9	-	16	Brown fine SAND with some SILT
20	16	-	22	Variegated coarse SAND
30	22	-	37	Reddish-brown fine SAND with SILT (compacted)
40	37	-	45	Variegated coarse SAND

MW-390

Top of Casing El.

195.15'

Ground Surface

BGS 70.0'

Grout Seal

BGS 74.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 101.51'

Cuttings and/or Sand

BGS 120'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 400 OWNER: USAF
LOCATION: WLFZ LF-4 ADDRESS: Castle AFB

TOTAL DEPTH 120'
SURFACE ELEVATION: _____ WATER LEVEL: _____
Mud
DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE DRILLED: 11/29/84
DRILLER: B.S. HELPER: _____
LOG BY: WWB

NOTES:

DEPTH (FEET)	DATA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	8	Brown fine to medium SAND (disturbed soil) (loose chunks of concrete)
10	0	8	- 13	Reddish-brown iron-silicate (cement); fine to medium SAND with some SILT (hard pan)
	0	13	- 18	Variegated coarse SAND
20	0	18	- 26	Brown SILTY fine to medium SAND with some coarse SAND and trace medium GRAVEL
	0	26	- 44	Reddish-brown SILTY CLAY with some fine SAND
30	0			
	0			
	0			
40	0			

* ASTM D1586

SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 400

OWNER: _____

LOCATION: _____

ADDRESS: _____

SURFACE ELEVATION: _____

TOTAL DEPTH _____

SURFACE ELEVATION: _____

WATER LEVEL: _____

DRILLING COMPANY: _____ DRILL METHOD: _____

DRILLING METHOD:

DATE _____

METHOD:

DRILLED:

DRILLER: _____

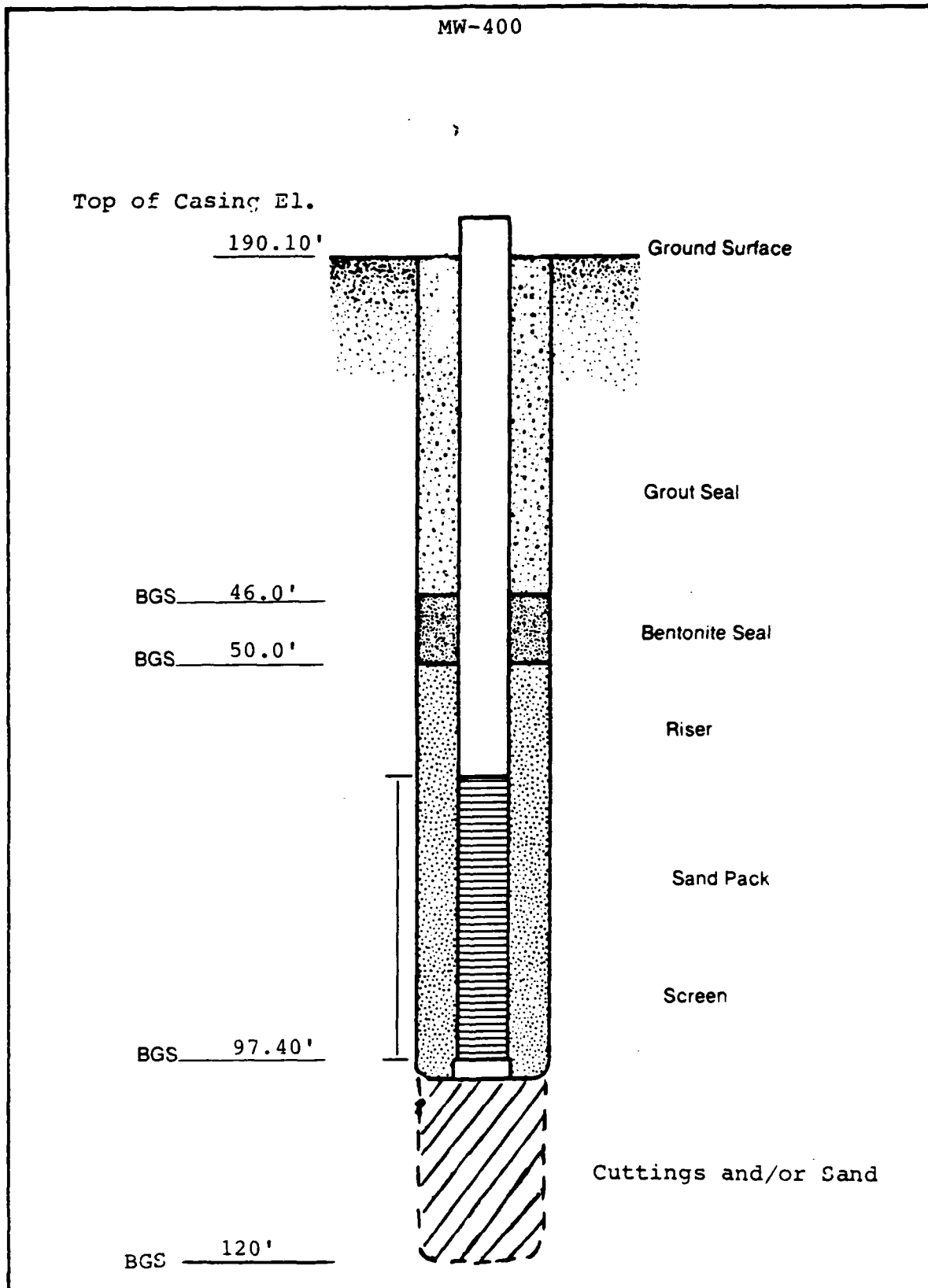
HELPER: _____

LOG BY: WWB

NOTES:

DEPTH (FEET)		OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
80				
	0			
90				
	0			
	0			
100				
	0			
		102 - 120		Variegated coarse SAND
	0			
	0			
110				
	0			
	0			
120				END OF DRILLING

MW-400





DRILLING LOG

WELL NUMBER: MW 410 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)		OVA/HNU		INTERVAL (FEET)		DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40	0	43	-	58		Brown olive green CLAY with trace coarse SAND
	0					
	0					
50	0					
	0					
	0					
	0					
60	0	58	-	71		Variegated coarse SAND with some fine SAND
	0					
	0					
	0					
	0					
70	0	71	-	95		Variegated fine to coarse GRAVEL with some coarse SAND (hard drilling)
	0					
	0					
	0					
80	0					



DRILLING LOG

WELL NUMBER: MW 410 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH: _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
80			
0			
90			
0			
	95	- 102	Brown CLAY (medium to high plastic) with trace fine SAND and coarse GRAVEL (rounded)
0			
100			
	102	- 110	Brown CLAY and variegated coarse SAND (interlayered)
0			
110			END OF DRILLING

WESTON

MW-410

Top of Casing El.

184.50'

Ground Surface

BGS 44.9'

Grout Seal

BGS 49.0'

Bentonite Seal

Riser

Sand Pack

BGS 94.60'

Screen

BGS 110'

Cuttings and/or Sand



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 420 OWNER: USAF
LOCATION: FT-2 ADDRESS: Castle AFB

TOTAL DEPTH: 120'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING METHOD: Mud Rotary DATE DRILLED: 11/16/84
DRILLER: B.S. HELPER: _____
LOG BY: WWB

NOTES:

DEPTH (FEET)	O.V.A./HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	7	Light brown fine to medium SAND
10	0	7	- 18	Reddish-brown coarse quartz SAND with some SILT
	0	18	- 21	Reddish-brown iron-silicate cemented fine to medium SAND with some SILT
20		21	- 38	Reddish brown coarse quartz SAND with iron-silicate cemented fine SAND and CLAY (interlayered)
30	0			
	0	38	- 57	Reddish brown CLAY
40				

ASTM D1586



DRILLING LOG

WELL NUMBER: MW 420 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/INU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40			
0			
50			
0			
0	57	- 68	Reddish brown coarse calcareous SAND
60			
0			
0	68	- 74	Olive gray CLAY
70			
0	74	- 86	Variegated coarse SAND and medium to coarse GRAVEL (hard drilling)
80			
0			



DRILLING LOG

WELL NUMBER: MW 420 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH: _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)		O/A/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
80					
	0	86	-	92	Variegated coarse SAND with olive-gray CLAY (interlayered)
90					
	0	92	-	98	Variegated coarse SAND
	0				
100		98	-	120	Variegated coarse SAND and olive-gray CLAY (interlayered)
	0				
110					
	0				
120					END OF DRILLING

* ASTM D1586

WESTON

MW-420

Top of Casing El.

184.73'

Ground Surface

BGS 46.0'

Grout Seal

BGS 50.0'

Bentonite Seal

Riser

Sand Pack

BGS 97.31'

Screen

BGS 120'

Cuttings and/or Sand

D-90



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 430 OWNER: USAF
LOCATION: FS-3 ADDRESS: Castle AFB
Flight Line
TOTAL DEPTH: 95'
SURFACE ELEVATION: _____ WATER LEVEL: _____
Mud
DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE 11/12/84
DRILLER: B.S. HELPER: _____

LOG BY: WWBNOTES:

DEPTH (FEET)	O.V.A./H.N.U.		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	3	Reddish-brown compacted fine SAND with some GRAVEL
	3	-	11	Gray CLAY (brittle) with some SILT
10				
	11	-	16	Yellow-brown CLAY with trace fine SAND
	16	-	19	Variegated coarse SAND (micaceous)
20				
	19	-	38	Yellow olive-gray CLAY (micaceous)
30				
	38	-	46	Variegated coarse SAND (micaceous) w/some fine GRAVEL
40				



DRILLING LOG

WELL NUMBER: MW 430 OWNER: USAF
LOCATION: _____ ADDRESS: Castle AFB

TOTAL DEPTH: _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40			
0			
	46	- 68	Variegated coarse SAND with medium to coarse GRAVEL (interlayered) (drilling somewhat hard)
50			
0			
0			
60			
0			
0	68	- 79	Variegated fine to very coarse GRAVEL (well rounded) (drilling hard)
70			
0			
0			
80			
0			

MW-430

Top of Casing El.

183.17'

Ground Surface

BGS 25.0'

Grout Seal

BGS 28.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 78.41'

Cuttings and/or Sand

BGS 95'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 440 OWNER: USAF
LOCATION: DA-2 ADDRESS: Castle AFB
TOTAL DEPTH 120'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING Mud DATE
METHOD: Rotary DRILLED 1/17/84
DRILLER: TR HELPER: _____
LOG BY: BWB/WWB

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	-	1	Tan fine SAND w/some SILT and 2 (1/2") asphalt layers
	1	-	5	Orange brown fine SAND with some SILT
	5	-	12	Reddish-brown fine to medium SAND with some SILTY CLAY (lenses)
	0			
10				
	0	12	- 17	Reddish-brown SILTY CLAY
	17	-	22	Reddish-brown SILTY CLAY w/some variegated medium SAND (lenses)
20	0			
	22	-	26	White fine to medium quartz SAND w/some CLAY
	0	26	- 34	Light gray SILTY CLAY w/trace fine to coarse SAND
30	0			
	34	-	59	Light gray SILTY CLAY w/reddish-brown compacted SILT (lenses)
	0			
40				



DRILLING LOG

WELL NUMBER: MW 440 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE _____
DRILLER: _____ HELPER: _____

LOG BY: BWB/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)		OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
80					
	0				
90					
	0	91	-	96	Variegated fine to coarse SAND (micaceous) with some CLAY (lenses)
		96	-	98	Variegated medium to coarse GRAVEL
100	0	98	-	105	Reddish-brown SANDY CLAY
	0				
		105	-	120	Tan SILTY CLAY (medium plastic) with some SANDY CLAY (lenses)
110	0				
	0				
120					END OF DRILLING

MW-440

Top of Casing El.

178.93'

Ground Surface

BGS 67.6'

Grout Seal

BGS 72.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 96.90'

Cuttings and/or Sand

BGS 120'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 450 OWNER: USAF
LOCATION: FT-3 ADDRESS: Castle AFB
TOTAL DEPTH 105'
SURFACE ELEVATION: _____ WATER LEVEL: _____
Mud
DRILLING COMPANY: Stang DRILLING METHOD: Rotary DATE DRILLED: 11/6/84
DRILLER: TR HELPER: _____
LOG BY: BWB/WWB

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	- 2	Yellow-brown fine to medium SAND w/some SILT (friable)
	2	- 4	Yellow-brown iron-silicate medium SAND (compacted)
	4	- 12	Yellow-brown medium SAND with some SILT
0			
10			
	12	- 20	Brown medium to coarse SAND (micaceous)
0			
20	0		
	20	- 28	Brown medium SAND
0			
30	28	- 35	Brown medium SAND w/some CLAY
0			
	35	- 50	Tan CLAY w/some medium SAND
0			
40			

* A.S.T.M. D1586



DRILLING LOG

WELL NUMBER: MW 450 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: BWB/WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU		INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40				
	0			
50				
	0			
	50	-	57	Brown fine to medium SAND w/trace CLAY
	0			
	57	-	65	Brown fine to coarse SAND with trace CLAY
60				
	0			
	65	-	73	Brown SILTY CLAY w/little medium SAND
	0			
70				
	0			
	73	-	88	Variegated fine to coarse SAND and variegated fine to medium GRAVEL (hard drilling)
80				
	0			

* ASTM D1586

SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 450

OWNER: _____

LOCATION: _____

ADDRESS: _____

TOTAL DEPTH _____

SURFACE ELEVATION: _____

WATER LEVEL: _____

DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____

DRILLING METHOD:

DATE _____

DRILLED: _____

DRILLER: _____ **HELPER:** _____

HELPER: _____

LOG BY: BWB/WWB

NOTES:

[illegible]

MW-450

Top of Casing El.

180.13'

Ground Surface

BGS 45.3'

Grout Seal

BGS 49.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 94.97'

Cuttings and/or Sand

BGS 105'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 460 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE DRILLED: _____
DRILLER: _____ HELPER: _____
LOG BY: WWB

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
40			
0			
46		57	Olive gray CLAY with some coarse variegated SAND
50			
0			
0			
57	-	90	Variegated coarse SAND with trace olive-gray CLAY (lenses)
60			
0			
0			
70			
0			
0			
80			

SKETCH MAP

[illegible]

MW-460

Top of Casing El.

184.05'

Ground Surface

BGS 46.0'

Grout Seal

BGS 50.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 96.45'

Cuttings and/or Sand

BGS 110'



SKETCH MAP

DRILLING LOG

WELL NUMBER: MW 470 OWNER: USAF
LOCATION: ELEZ LE-3 ADDRESS: Castle AFB
TOTAL DEPTH 120'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING Mud DATE
METHOD: Rotary DRILLED: 11/27/84
DRILLER: B.S. HELPER: _____
LOG BY: WWB

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0	0	- 2	Reddish-brown CLAYEY fine to medium SAND
	2	- 9	Reddish-brown iron-silicate compacted brittle CLAY w/some silt and trace fine SAND
0			
10	9	- 26	Tan SILTY fine SAND and variegated coarse SAND (interbedded)
20			
	26	- 52	Olive-gray CLAY (micaceous) with trace variegated coarse SAND
0			
30			
40			



DRILLING LOG

WELL NUMBER: MW 470 OWNER: _____
LOCATION: _____ ADDRESS: _____

TOTAL DEPTH _____
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: _____ DRILLING METHOD: _____ DATE _____
DRILLER: _____ HELPER: _____
LOG BY: WWB

SKETCH MAP

NOTES:

DEPTH (FEET)	OVA/HNU	INTERVAL (FEET)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
80			
0			
90			
0	91	- 102	Variegated coarse SAND
0			
100			
0	102	- 120	Olive-gray CLAY and variegated coarse SAND (interlayered)
0			
110			
0			
120			END OF DRILLING

MW-470

Top of Casing El.

181.87'

Ground Surface

BGS 45.5'

Grout Seal

BGS 50.0'

Bentonite Seal

Riser

Sand Pack

Screen

BGS 97.03'

Cuttings and/or Sand

BGS 120'

D.2 LYSIMETERS

SKETCH MAP

DRILLING LOG

WELL NUMBER: L 230
LOCATION: South Landfill

OWNER: USAF
ADDRESS: Castle AFB CA

_____ TOTAL DEPTH 5.0'
 SURFACE ELEVATION: _____ WATER LEVEL: _____

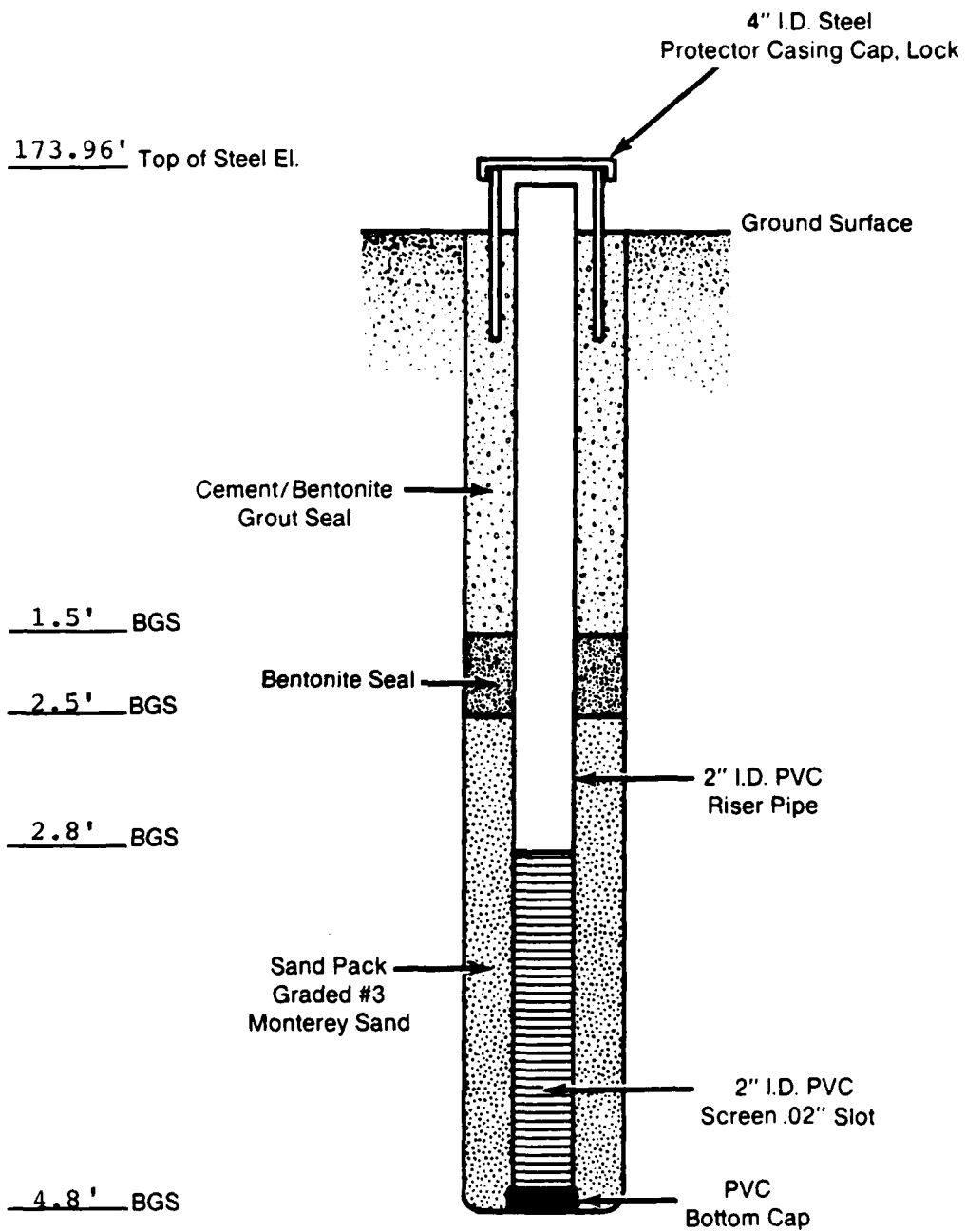
DRILLING COMPANY: Stang DRILLING METHOD: Auger DATE DRILLED: 11-16-84
DRILLER: BS HELPER: JR

LOG BY: DJ

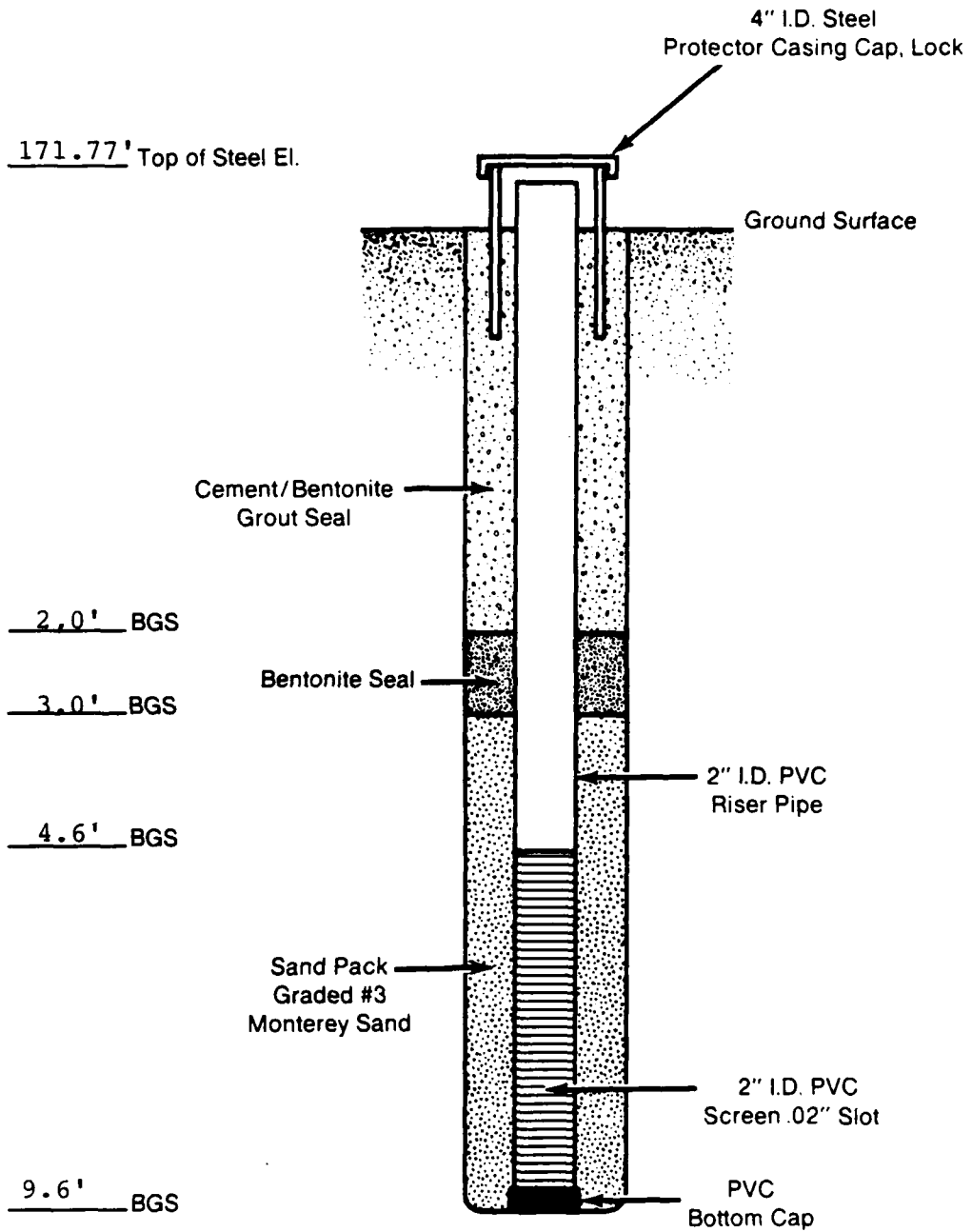
NOTES:

[illegible]

L 230



L 250



SKETCH MAP

DRILLING LOG

WELL NUMBER: L 310 OWNER: USAF
LOCATION: Discharge Area 5 ADDRESS: Castle AFB CA
(FITS Squadron Area)

TOTAL DEPTH 11.0'

SURFACE ELEVATION: _____ WATER LEVEL: _____

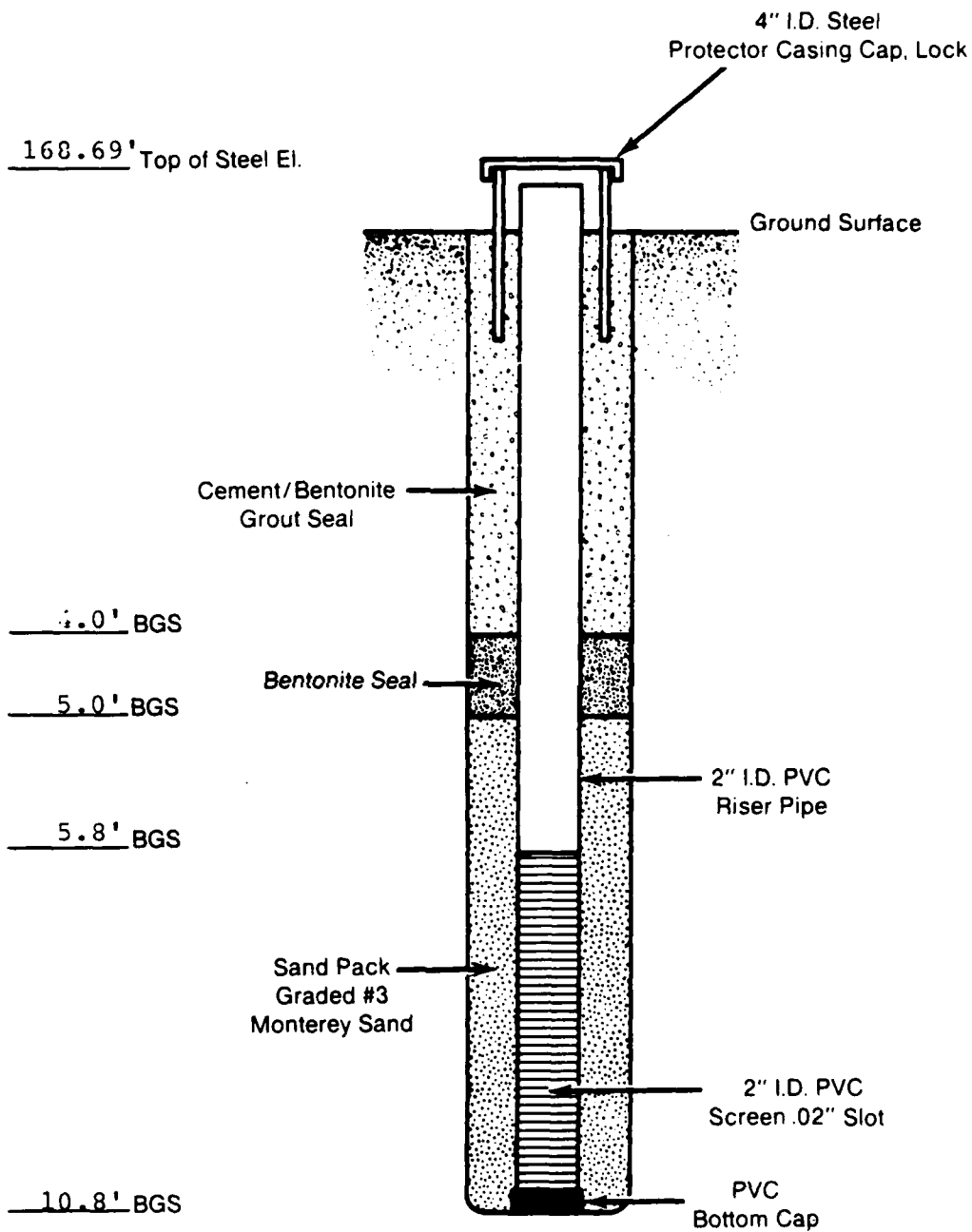
DRILLING COMPANY: Stang DRILLING METHOD: Auger DATE DRILLED: 11-17-84
DRILLER: BS HELPER: JR

LOG BY: D.J.

NOTES:

[illegible]

L 310





DRILLING LOG

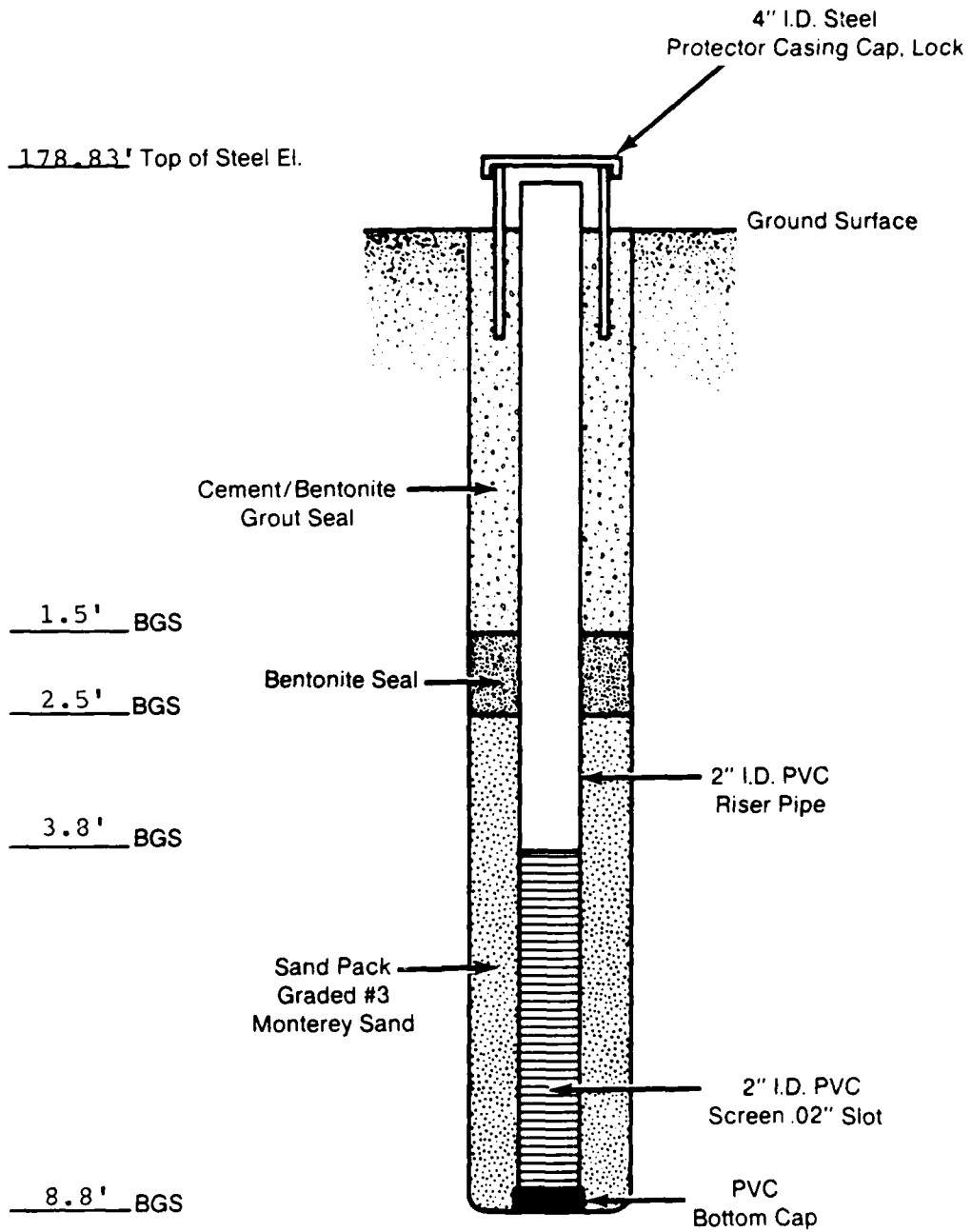
WELL NUMBER: L 330 OWNER: USAF
LOCATION: Dog Kennels ADDRESS: Castle AFB CA
TOTAL DEPTH: 8.5'
SURFACE ELEVATION: _____ WATER LEVEL: _____
DRILLING COMPANY: Stang DRILLING METHOD: Auger DATE DRILLED: 11-16-84
DRILLER: B.S. HELPER: J.R.
LOG BY: D.J.

SKETCH MAP

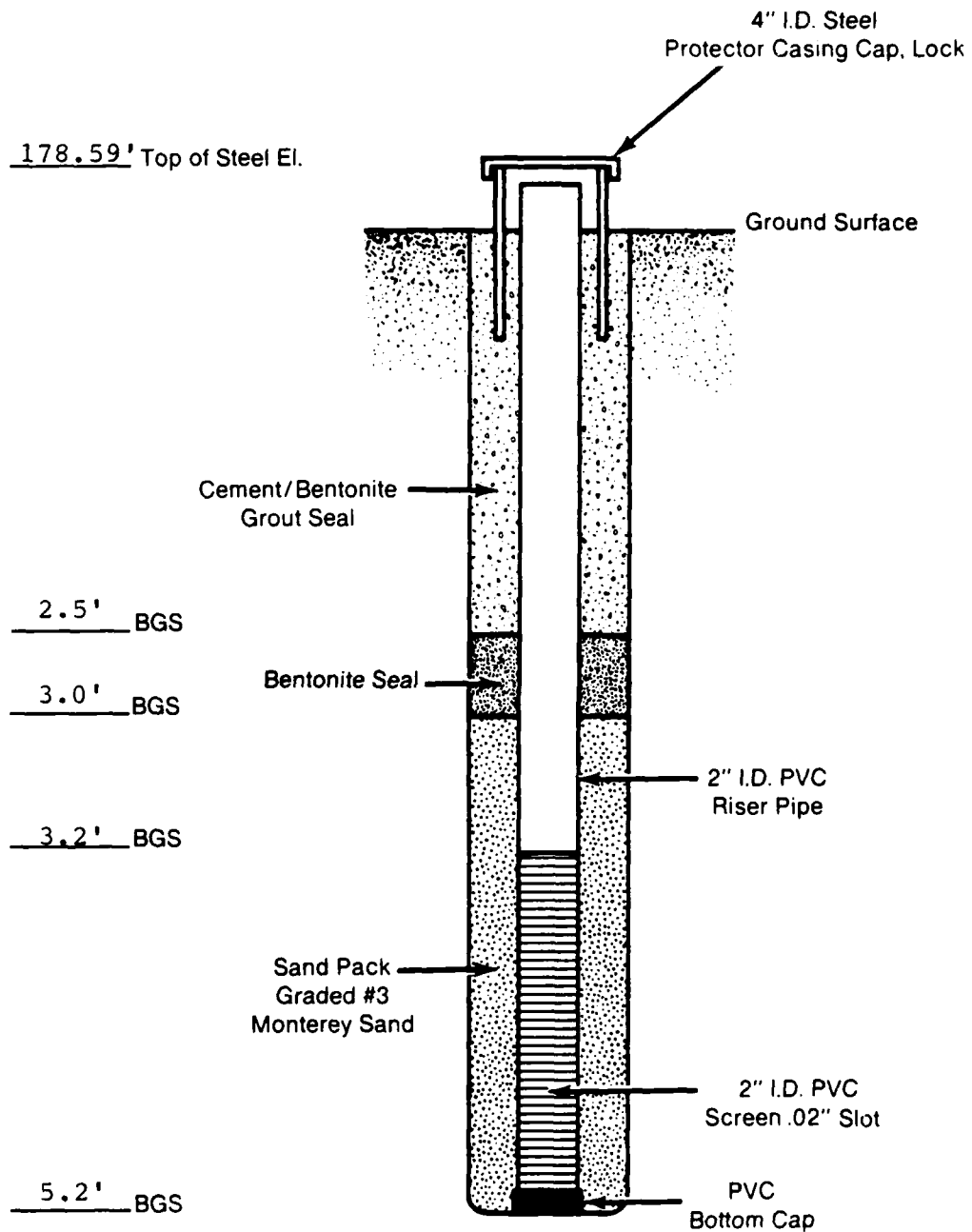
NOTES:

DEPTH (FEET)	HNU / OVA			SAMPLE NUMBER	% RECOVERY	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0							0-2' Brown sandy SILT with some clay (no sample)
5	1	100	10				
			10				5-6.5' Brown med. SAND with trace clay
			27				
10	2	67	6				
			31				10-11.5' 2" yellowish brown cemented SAND
			63				over 10" of mottled gray and reddish brown CLAY

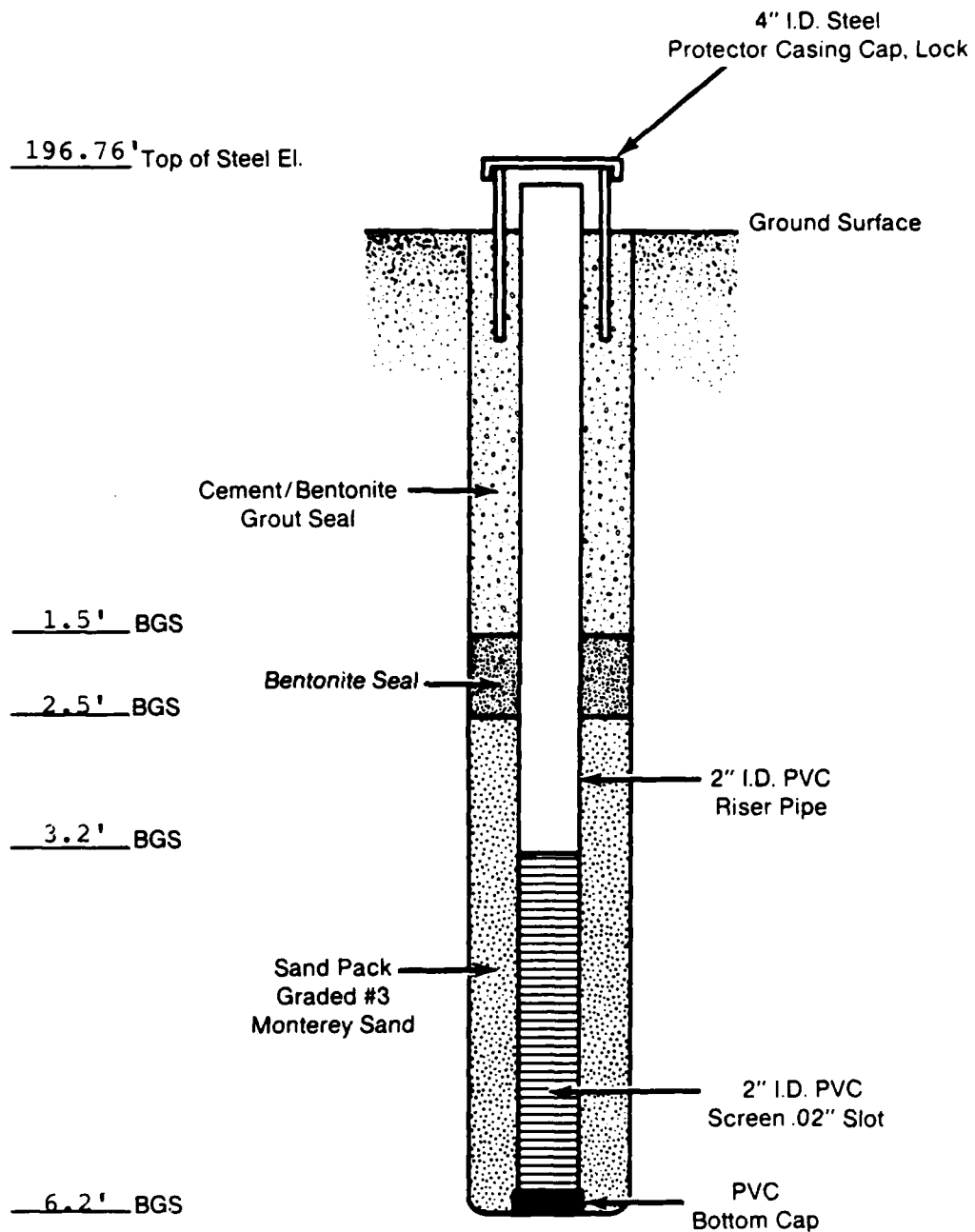
L 330



L 340



L 380



SKETCH MAP

DRILLING LOG

WELL NUMBER: L 430

OWNER: USAF

LOCATION: Flight Line Area

ADDRESS: Castle AFB CA

TOTAL DEPTH 6.0'

SURFACE ELEVATION:

WATER LEVEL:

DRILLING
COMPANY: Stang

DRILLING METHOD: Auger

DATE
DRILLED: 11-19-84

DRILLER: B.S.

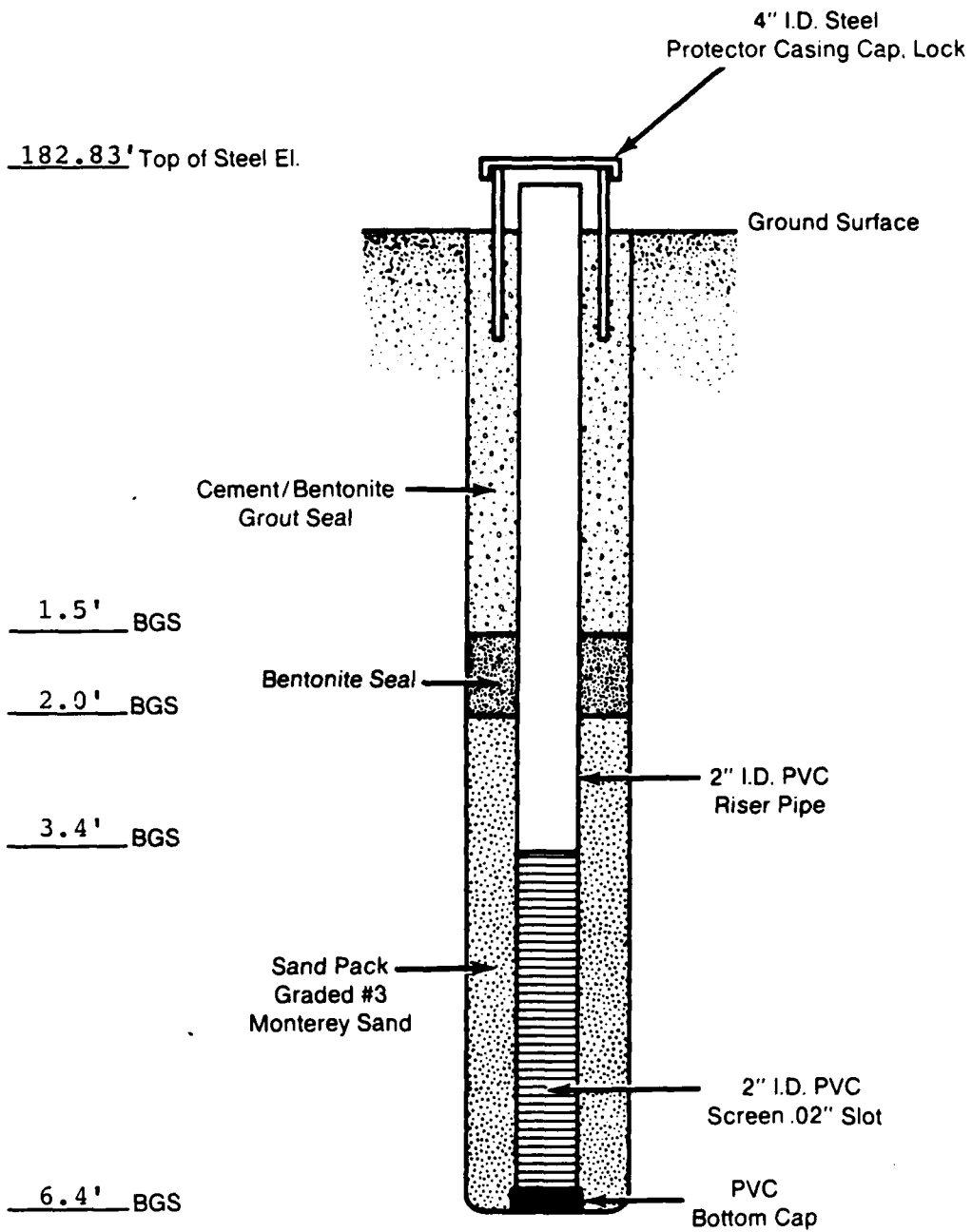
HELPER: J.R.

LOG BY: D.J.

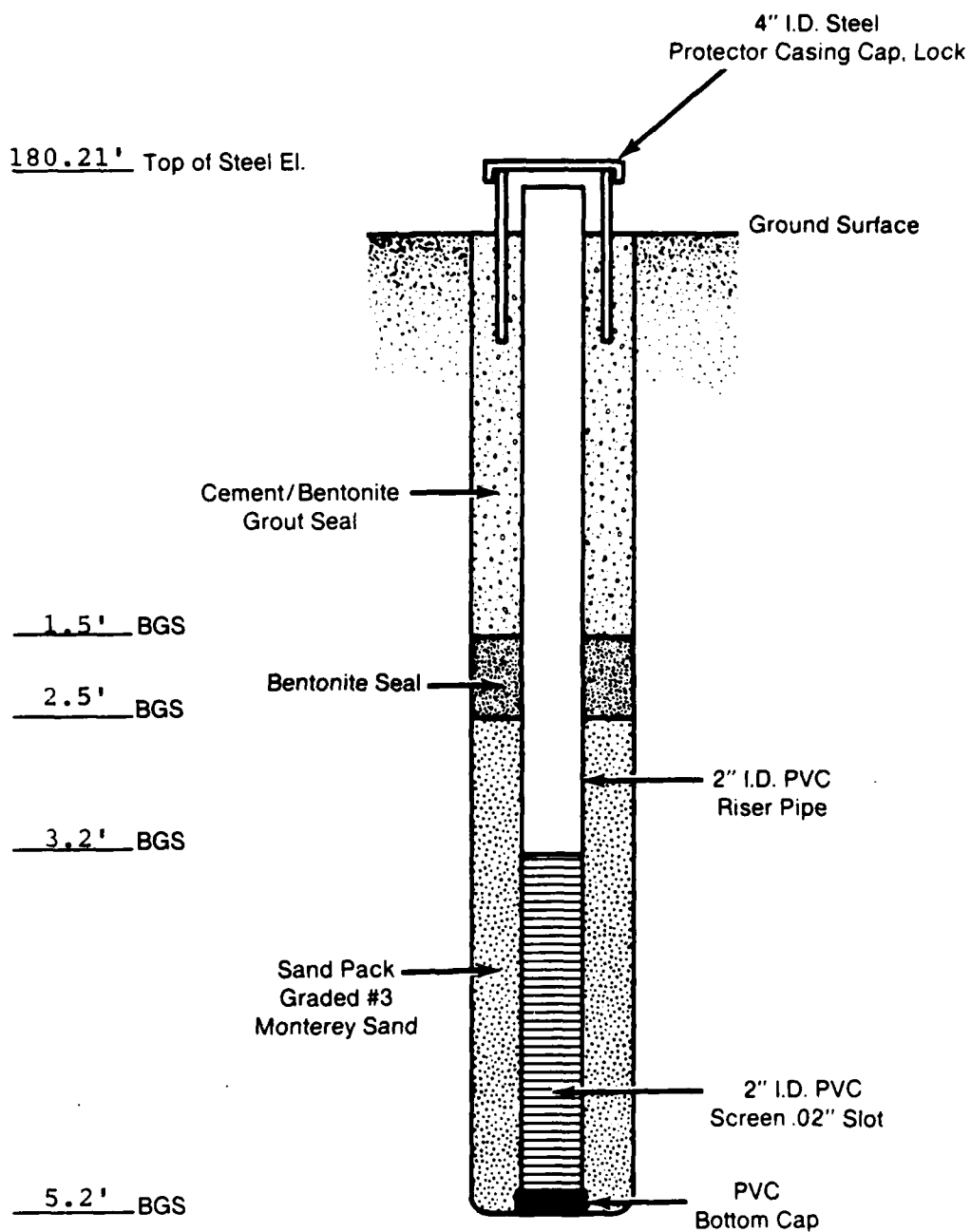
D.J.

[illegible]

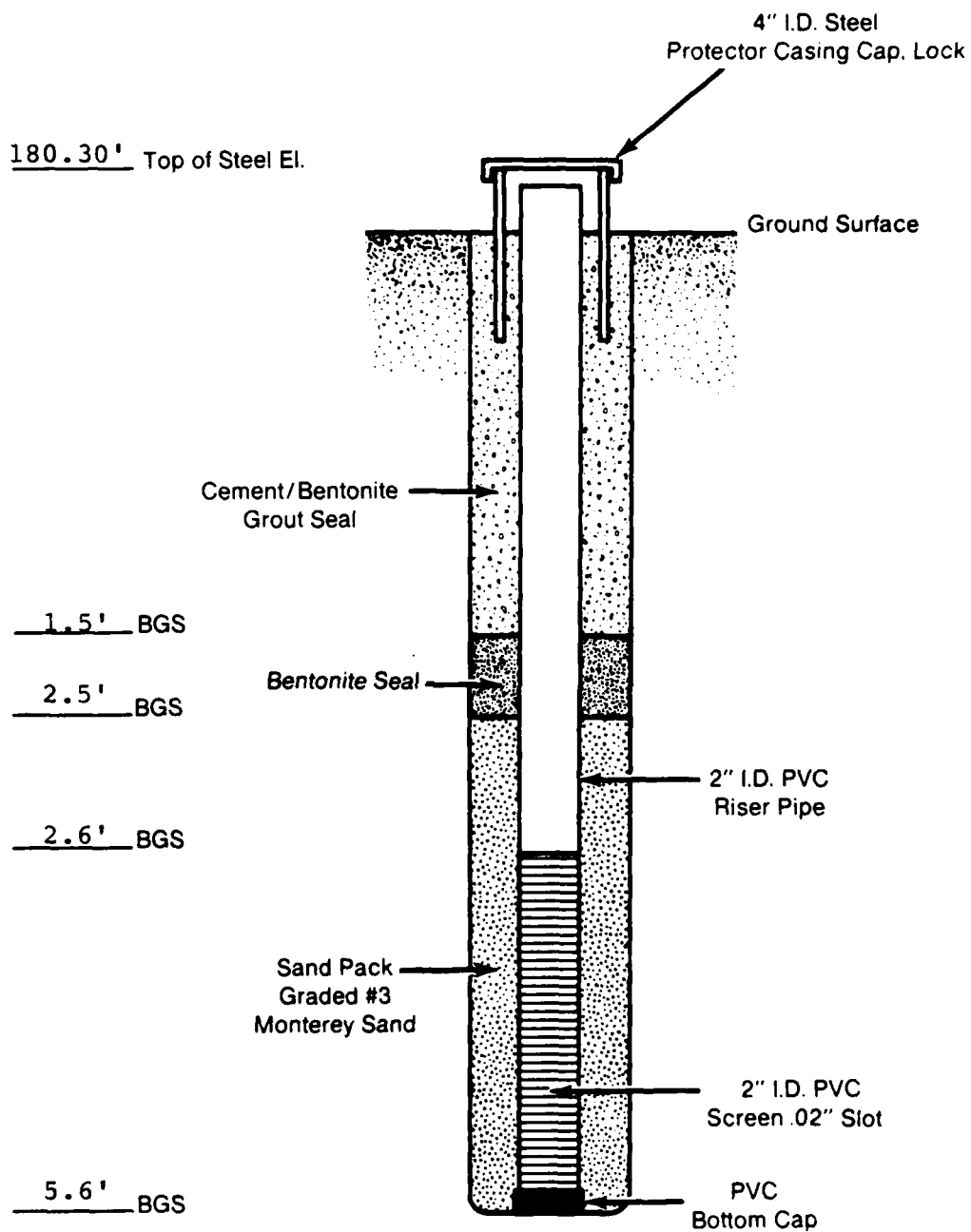
L 430



L 431



L 432





DRILLING LOG

WELL NUMBER: L 433

OWNER: USAF

LOCATION: Flight Line Area

ADDRESS: Castle AFB CA

TOTAL DEPTH 9.0'

SURFACE ELEVATION: _____

WATER LEVEL: _____

DRILLING COMPANY: Stang

DRILLING METHOD: Auger

DATE DRILLED: 11-15-84

DRILLER: B.S.

HELPER: M.O.

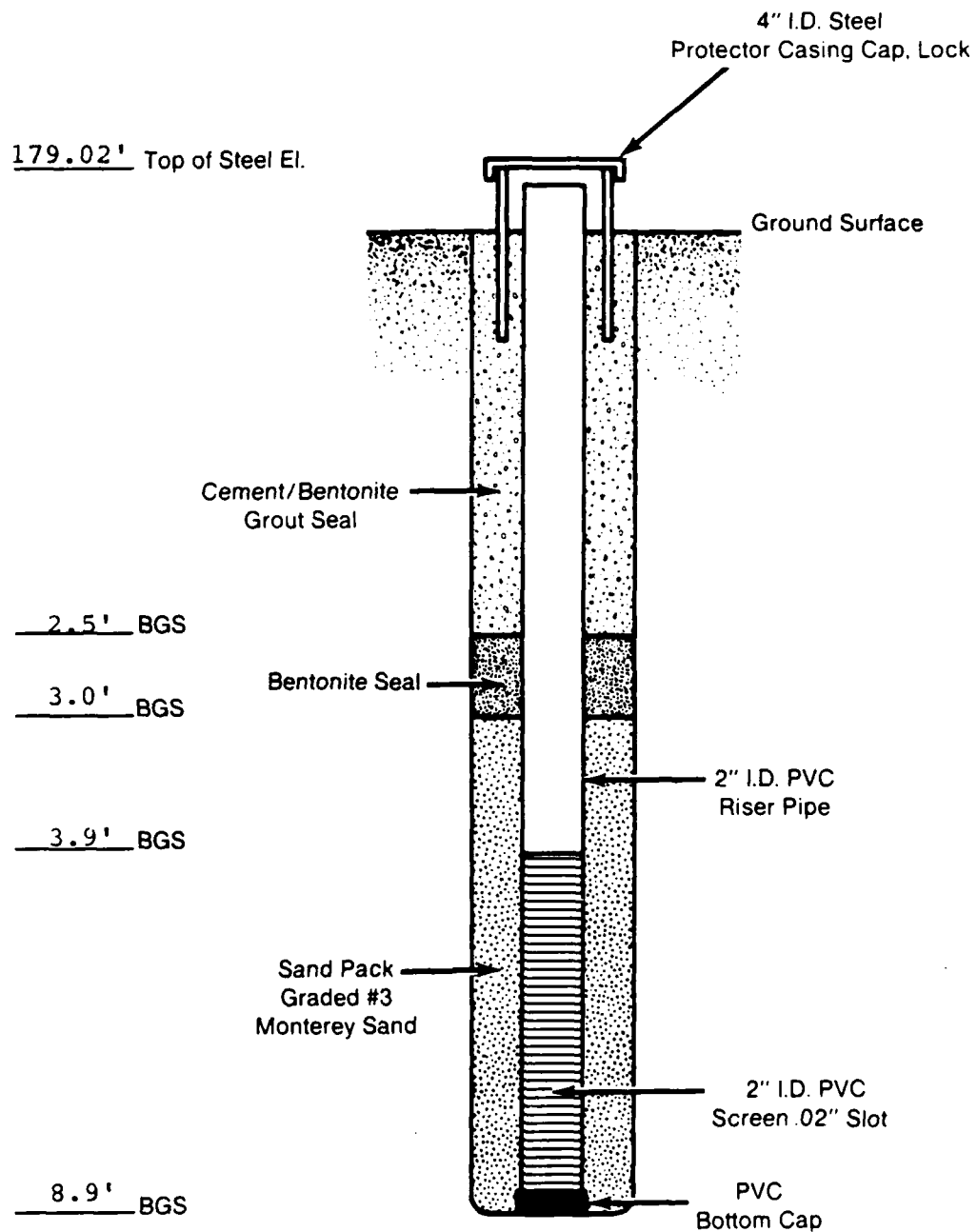
LOG BY: D.J.

SKETCH MAP

NOTES:

DEPTH (FEET)	HNU / OVA	SAMPLE NUMBER	% RECOVERY	SAMPLE BLOWS	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0					No sample
5	1	100	11 40 41		5-6.5' Strong brown fine SAND, some silt trace clay
10	2	100	38 6"		10-10.5' 6" of strong brown med. SAND with trace clay over light yellowish brown iron cemented fine to med. SAND

L 433



SKETCH MAP

DRILLING LOG

WELL NUMBER: L 450

OWNER: USAF

LOCATION: Fire Training
Area

ADDRESS: Castle AFB CA

TOTAL DEPTH 11.0'

SURFACE ELEVATION: _____

WATER LEVEL: _____

DRILLING COMPANY: Stang DRILL METH

DRILLING METHOD: Auger DATE DRILLED: 11-17-84

DRILLER: B.S.

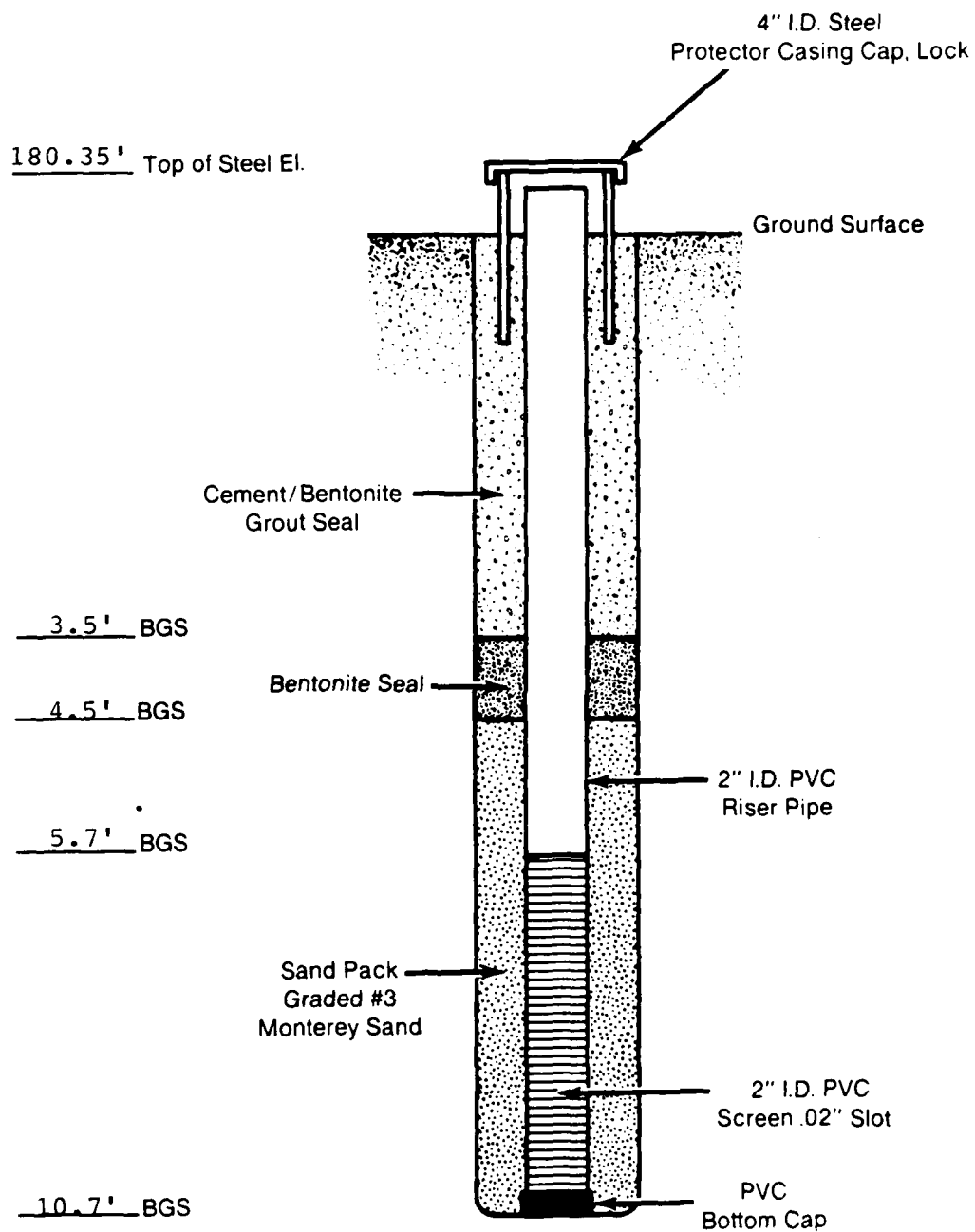
HELPER: J.R.

LOG BY D.J.

NOTES:

[illegible]

L 450



D.3 TEST WELLS
(From ESI, 1983)

J. H. KLEINFELDER & ASSOCIATES
 GEOTECHNICAL CONSULTANTS - MATERIALS TESTING

BORING LOG

HOLE NO. Well 12		PROJECT NO. 81-0623		PROJECT Water Sampling Wells		SHEET 1 OF 7	
MFR. DESIGNATION OF DRILL Acker AD-II				LOCATION Castle AFB			
TYPE OF BIT		HAMMER DATA. WT.		LBS. DROP		INCHES/ELEV	
DATE		DRILLING AGENCY		J. H. Kleinfelder & Assoc.		TOTAL DEPTH OF HOLE 100'	
STARTED		INSPECTOR		GROUNDWATER DEPTH		TIME	
COMPLETED		CREW					
BACKFILLED							
SURFACE CONDITIONS							

DIST FROM SURF.	LEGEND	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL
5							SM Silty Sand.
10							
15							
20							
25							SC Clayey Sand.
30							
35							SM Silty Sand.
40							
45							SP Clean Fine to Medium Sand.
50							
55							
60							
65							
70							
75							SM Gravel.
80							
85							
90							SP Fine Sand.
95							CL Clay.
100							Pump at Bottom of Well Screen
105							

SHEET 1 OF 7

J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS - MATERIALS TESTING

BORING LOG

HOLE NO. Well 13		PROJECT NO. 81-0623		PROJECT Water Sampling Wells		SHEET 2 OF 7	
WPN. DESIGNATION OF DRILL Acker AD-II				LOCATION Castle AFB			
TYPE OF BIT		HAMMER DATA: WT.		LBS. DROP		INCHES/ELEV	
STARTED		DRILLING AGENCY		J. H. Kleinfelder & Assoc.		TOTAL DEPTH OF HOLE 95'	
DATE	COMPLETED	INSPECTOR		GROUNDWATER DEPTH		TIME	
	BACKFILLED	CREW					
SURFACE CONDITIONS							

DIST. FROM SURF.	LOGS	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL
5							SM Silty Sand
10							
15							
20							
25							
30							
35							
40							
45							
50							
55							
60							CL Clay
65							SM Silty Sand
70							GM Gravel
75							
80							SP Sand
85							Well Screen
90							CL Clay
95							Pump at Bottom of Well Screen.
100							
105							



H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS - MATERIALS TESTING

BORING LOG

HOLE NO.		PROJECT NO.		PROJECT		SHEET	
Well 14		81-0623		Water Sampling Wells		3 of 7	
WFG DESIGNATION OF DRILL				LOCATION			
Acker AD-II				Castle AFB			
TYPE OF BIT		HAMMER DATA. WT.		LBS DROP		INCHES ELEV	
STARTED		DRILLING AGENCY		J. H. Kleinfelder & Assoc.		TOTAL DEPTH OF HOLE	
COMPLETED		INSPECTOR		GROUNDWATER DEPTH		TIME	
BACKFILLED		CREW					
SURFACE CONDITIONS							
DIST FROM SURF		SAMPLE TYPE		SAMPLE NO.		RECOVERY	
LOG OF MATERIAL		BLOWS PER 6 IN.		USCS			
5						SM Silty Sand.	
10							
15							
20							
25							
30							
35						CL Sandy Clay.	
40							
45							
50						SP Fine to Medium Sand.	
55							
60							
65							
70							
75						GM Gravel.	
80							
85		Well Screen					
90						CL Sandy Clay.	
95						CL Clay.	
100						Pump at Bottom of Well Screen	
105							

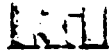


J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS - MATERIALS TESTING

BORING LOG

HOLE NO.		PROJECT NO.		PROJECT		SHEET 4 OF 7	
Well 15		81-0623		Water Sampling Wells			
WPA DESIGNATION OF DRILL				LOCATION			
Acker AD-II				Castle AFB			
TYPE OF BIT		HAMMER DATA: WT.		LBS. 3000		INCHES ELEV	
STARTED		DRILLING AGENCY J. H. Kleinfelder & Assoc.				TOTAL DEPTH OF HOLE 90'	
DATE	COMPLETED	INSPECTOR		GROUNDWATER DEPTH		TIME	
	BACKFILLED	CREW					
SURFACE CONDITIONS							

DIST. FROM SURF.	LOG NO.	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLWS PER 6 IN.	USCS	LOG OF MATERIAL
5							SM Very-Silty Fine Sand.
10							
15							
20							
25							
30							
35							
40							
45							
50							
55							
60							
65							
70							
75							
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100							
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965							
970							
975							
980							
985							
990							
995							
1000							



J. H. KLEINFELDER & ASSOCIATES

GEO-TECHNICAL CONSULTANTS - MATERIALS TESTING

BORING LOG

HOLE NO. Well 16 / Add-I		PROJECT NO. 81-0623		PROJECT Water Sampling Wells		15-12" 5 10" 7	
WPE DESIGNATION OF DRILL Acker AD-II				LOCATION Castle AFB			
TYPE OF BIT		HAMMER DATA: WT.		LBS. DROP		INCHES / ELEV	
STARTED		DRILLING AGENCY J. H. Kleinfelder & Assoc.				TOTAL DEPTH OF HOLE 102'	
DATE	COMPLETED	INSPECTOR		GROUNDWATER DEPTH		TIME	
	BACKFILLED	CREW					
	SURFACE CONDITIONS						

DIST FROM SURF	LOG	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL
5							SM Silty Sand.
10							
15							
20							
25							
30							
35							
40							
45							
50							
55							
60							GM Gravel
65							
70							
75							
80							
85							SP Fine to Medium Sand.
90							
95							
100							Well Screen
105							CL Sandy Clay
110							Pump at Bottom of Well Screen.

SHEET 01 OF 01



J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS - MATERIALS TESTING

BORING LOG

HOLE NO. Well 17 / Add-2		PROJECT NO. 81-0623		PROJECT Water Sampling Wells		SHEET 6 OF 7	
MFR. DESIGNATION OF DRILL Acker AD-II				LOCATION Castle AFB			
TYPE OF BIT		HAMMER DATA: WT.		LBS. DROP		INCHES / ELEV	
STARTED		DRILLING AGENCY J. H. Kleinfelder & Assoc				TOTAL DEPTH OF HOLE 100'	
COMPLETED		INSPECTOR		GROUNDWATER DEPTH		TIME	
BACKFILLED		CREW					
SURFACE CONDITIONS							

DIST FROM SURF.	LOG	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL
5							SM Silty Fine to Medium Sand.
10							
15							
20							
25							
30							
35							
40							
45							
50							
55							
60							
65							
70							GM Gravel
75							
80							
85							MT Fine Sandy Silt
90							
95							Well Screen
100							CL Clay.
105							Pump at Bottom of Well Screen

SHEET 6 OF 7



J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS - WATER RESOURCES TESTING

BORING LOG

HOLE NO. Well 18 / Add 1		PROJECT NO. 81-0623		PROJECT Water Sampling Wells		SHEET 7	
MFG. DESIGNATION OF DRILL Acker AD-II				LOCATION Castle AFB			
TYPE OF BIT		HAMMER DATA: WT		LBS. DROP		INCHES / FEET	
STARTED		DRILLING AGENCY		J. H. Kleinfelder & Assoc.		TOTAL DEPTH OF HOLE 95'	
COMPLETED		INSPECTOR		GROUNDWATER DEPTH		TIME	
BACKFILLED		CREW					
SURFACE CONDITIONS							

DIST FROM SURF	LOG	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL
5							SM Silty Sand.
10							
15							
20							
25							
30							CT. Clay
35							
40							SP Sand
45							
50							
55							
60							
65							GM Gravel
70							
75							
80							
85		Well Screen					
90							
95							SP Sand.
100							Pump at Bottom of Well Screen
105							

D.4 BASE PRODUCTION WELLS AND PILOT HOLES
(From Base files)

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

WELL DATA (1) Place and Owner Castle Air Force Base

(2) Source of Information Bob Wilde

Collected by C. Forbes

Date 3/18/80

(3) Number or Name	Well #1	Well #2	Well #3
Date drilled	1939	1939	1939
(4) Location: Neighborhood	Com.-Res.	Com.-Res.	Com.-Res.
Size of lot			
Distance to: Sewer			
Sewage disposal	None	None	None
Abandoned well	>100'	>100'	>100'
Nearest property line	>100'	>100'	>100'
(5) Housing: Type	Metal	Metal	Metal
Condition	Good	Good	Good
Pit depth (if any)	None	None	None
Floor (material)	Concrete	Concrete	Concrete
Drainage	Away	Away	Away
(6) Well Depth	305'	319'	290'
(7) Casing: Depth	273'	314'	267'
Diameter	14"	14"	14"
Kind	Steel	Steel	Steel
Height above floor	--	--	--
Distance to highest perforations	None	299'	--
Surface sealed (yes or no)	Yes	Yes	Yes
Gravel pack (yes or no)	No	No	No
Second casing depth	None	--	--
Second casing diameter	--	--	--
Annular seal (depth)	Unknown	Unknown	Unknown
(8) Impervious Strata: { Thickness	22'	10'	21'
Penetrated { Depth to	103'	120'	130'
(9) Water Levels: { Surface			
Depth to { Static	82'	82'	82'
{ When pumping	103'	103'	104'
(10) Pump: Make	Floway	Wintroath	Wintroath
Type	DWT	DWT	DWT
Capacity, g.p.m.	1600	1600	1600
Lubrication	Oil	Oil	Oil
Power	75 HP Elect	75 HP Elect	75 HP Elect
Auxiliary power	None	None	None
Control	ΔPSI	ΔPSI	ΔPSI
Discharge location	Above	Above	Above
Discharge to	Pressure Tank	Pressure Tank	Pressure Tank
(11) Frequency of Use	Daily	Daily	Daily
(12) Flood Hazard	Nil	Nil	Nil
(13) Remarks and Defects (Use other side if necessary)	No Casing Vent Unscreened vacuum relief	No Casing Vent Unscreened vacuum relief	No Casing Vent Unscreened vacuum relief

(14) Show well log on other side.

Castle Air Force Base - Well Logs

Well No. 1

0	-	5'	Surface Sand
5'	-	35'	Hard Pan
35'	-	57'	Surface Water Sand
57'	-	60'	Shale (Hard)
60'	-	67'	Sand
67'	-	95'	Coarse Gravel
95'	-	103'	Hard Shale
103'	-	125'	Gray Clay
125'	-	130'	Sand
130'	-	150'	Clay
150'	-	176'	Brown Sand
176'	-	197'	Sticky Clay
197'	-	245'	Crumby Clay
245'	-	256'	Water Sand
256'	-	295'	Red Clay
295'	-	305'	Sand Water

Casing Bottom - 273'

Static Level - 10'

Pumping Level at 1600 gpm - 30'

Open Bottom Well

Well No. 2

0	-	3'	Surface Sand
3'	-	29'	Hard Pan
29'	-	66'	Surface Water Sand
66'	-	67'	Sandy Shale
67'	-	90'	Coarse Gravel
90'	-	102'	Sandy Shale
102'	-	120'	Hard Shale Clay
120'	-	130'	Clay
130'	-	135'	Sand
135'	-	158'	Gray Clay
158'	-	200'	Red Clay
200'	-	232'	Gray Clay
232'	-	234'	Red Clay
234'	-	254'	Sand
253'	-	277'	Sand & Rock
277'	-	304'	Sandy M-1
304'	-	320'	Water, Sand, Rock

Casing Bottom - 319.5 feet

Perforations - 299 - 319.5 feet

Static Level - 15 feet

Pumping Level at 1600 gpm is 33'

Well No. 3

0	-	4'	Surface Sand
4'	-	6'	Hard Pan
6'	-	35'	Surface Water Sand
35'	-	36'	Clay
36'	-	72'	Sand
72'	-	87'	Coarse Gravel
87'	-	130'	Sand Stone
130'	-	151'	Gray Clay
151'	-	218'	Red Clay
218'	-	220'	Sand
220'	-	267'	Red Clay
267'	-	286'	Red Clay
286'	-	290'	Water Sand

Casing Bottom at 267'

Static Level is 8'

Pumping Level at 1600 gpm is 30'

Open Bottom Well

Well No. 4

0	-	2'	Surface Sand
2'	-	6'	Hard Pan
6'	-	15'	Surface Water Sand
15'	-	40'	Sandy Clay
40'	-	65'	Water Bearing Sand
65'	-	93'	Coarse Gravel
93'	-	129'	Sandy Clay
129'	-	139'	Gray Clay
139'	-	160'	Dirty Clay
160'	-	165'	Red Clay
165'	-	171'	Sand
171'	-	196'	Crumbley Clay
196'	-	213'	Red Dirt
213'	-	216'	Sand
216'	-	220'	Light Gravel
220'	-	255'	Red Clay
255'	-	290'	Sand Water

Casing Bottom at 270'

Static Level is 15'

Pumping Level at 1200 gpm is 34 feet

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

WELL DATA (1) Place and Owner Castle Air Force Base

(2) Source of Information Bob Wilde

Collected by C. Forbes

Date 3/18/80

(3) Number or Name	Well #4	Well #5	Well #6
Date drilled	1939	1956	Unknown
(4) Location: Neighborhood	Com-Res	Restricted Ammo Area	
Size of lot			
Distance to: Sewer		>100'	
Sewage disposal	>100'	>100'	
Abandoned well	>100'	~200'	
Nearest property line	>100'		
(5) Housing: Type	Metal	Concrete Block	
Condition	Good	Good	
Pit depth (if any)	None	None	
Floor (material)	Concrete	Concrete	
Drainage	Away	Away	
(6) Well Depth	290'	120'	120'
(7) Casing: Depth	270'	76'	76'
Diameter	14"	8"	8"
Kind	Steel	Steel	Steel
Height above floor	---	---	---
Distance to highest perforations	Unknown	Unknown	Unknown
Surface sealed (yes or no)	Yes	"	"
Gravel pack (yes or no)	No	"	"
Second casing depth	---	---	---
Second casing diameter	---	---	---
Annular seal (depth)	Unknown	Unknown	Unknown
(8) Impervious Strata: { Thickness	36'	11'	11'
Penetrated { Depth to	93'	26'	26'
(9) Water Levels: { Surface			
Depth to { Static	80'	44'	44'
{ When pumping	102'	51'	48'
(10) Pump: Make	Wintroath	Fairbanks-Morse	Fairbanks-Morse
Type	DWT	DWT	DWT
Capacity, g.p.m.	1200	35	35
Lubrication	Oil	Oil	Oil
Power	75 HP Elect	3 HP Elect	3 HP Elect
Auxiliary power	None	None	None
Control	ΔPSI	ΔPSI	ΔPSI
Discharge location	Above	Unknown	Unknown
Discharge to	Pressure Tank	Unknown	Unknown
(11) Frequency of Use	Daily	Daily	Daily
(12) Flood Hazard	Nil	Unknown	Unknown
(13) Remarks and Defects (Use other side if necessary)	No casing vent Unscreened vacuum relief	This well was <u>not</u> inspected	This well was <u>not</u> inspected
(14) Show well log on other side.			

WELL # 5

FORMATION ENCOUNTERED DURING DRILLING	DEPTH (Ft)	STRATUM NO.
Top Soil	0'-1'	
Red Sandy Clay	1'-2'	
Hard - Pan	2'-2'6"	
Sandy Clay	2'6"-7'	
Hard Grey Sandy Clay (Hard-Pan lenses)	7'-10'	
Light brown Sandy Clay	10'-17'	
Soft Light grey Sandy clay	17'-23'	
Red Sand (water)	23'-26'	
Brown Sandy clay	26'-30'	
Brown Sandy clay (water, perforated)	30'-37'	
35' to 42'		
Light Brown sand	40'-46'	
Sandy clay	46'-47'	
Fine white sand (water)	47'-53'	
Sandy Clay	53'-56'	
Sand, Buck & Gravel (water)	56'-67'	
Perforated 55' - 70'		
Brown Sandy clay	67'-76'	
Casing shoe set at 76' on weathering layer concrete plug set at 76'-0"		
Hard Brown clay	76'-86'	
open Hole	86'-126'	

AF FORM 92c, AUG 68

Page 2 of 2 pages

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WELL #6

NOTE: SAME AS WELL #5

AD-A168 226

INSTALLATION RESTORATION PROGRAM PHASE II
CONFIRMATION/QUANTIFICATION STA. (U) WESTON (ROY F) INC
WEST CHESTER PA A L DUNN ET AL. 28 JUN 85

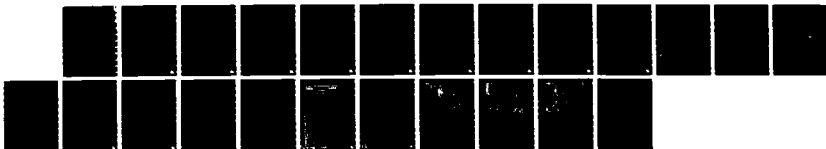
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

WELL DATA (1) Place and Owner Castle Air Force Base

(2) Source of Information Bob Wilde

Collected by C. Forbes

Date 3/18/80

(3) Number or Name	Well #7	Well #8	Well #9
Date drilled	1951	1951	1951
(4) Location: Neighborhood	Residential	Residential	Residential
Size of lot			
Distance to: Sewer			
Sewage disposal	>100'	>100'	>100'
Abandoned well	>100'	>100'	>100'
Nearest property line	15'	15'	15'
(5) Housing: Type	Metal	Metal	Metal
Condition	Good	Good	Good
Pit depth (if any)	None	None	None
Floor (material)	Concrete	Concrete	Concrete
Drainage	Away	Away	Away
(6) Well Depth	260'	300'	300'
(7) Casing: Depth	260'	290'	285'
Diameter	14"	16"	16"
Kind	Steel	Steel	Steel
Height above floor	--	--	--
Distance to highest perforations	Unknown	Unknown	Unknown
Surface sealed (yes or no)	Yes	Yes	Yes
Gravel pack (yes or no)	No	No	No
Second casing depth	Unknown	Unknown	Unknown
Second casing diameter	"	"	"
Annular seal (depth)	"	"	"
(8) Impervious Strata: { Thickness	Unknown	Unknown	Unknown
Penetrated { Depth to	Unknown	"	Unknown
(9) Water Levels: { Surface			
Depth to { Static	36'	42'	38'
{ When pumping	46'	50'	56'
(10) Pump: Make	Aurora	Fairbanks-Morse	Fairbanks-Morse
Type	DWT	DWT	DWT
Capacity, g.p.m.	500	1200	1200
Lubrication	Water	Oil	Oil
Power	75 HP Elect	100 HP Elect	100 HP Elect
Auxiliary power	None	None	None
Control	APSI	APSI	APSI
Discharge location	Above	Above	Above
Discharge to	PT	PT	PT
(11) Frequency of Use	Daily	Daily	Daily
(12) Flood Hazard	Nil	Nil	Nil
(13) Remarks and Defects (Use other side if necessary)	No Well Logs Exist for These Three Wells		

(14) Show well log on other side.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

WELL DATA (1) Place and Owner Castle Air Force Base

(2) Source of Information Bob Wilde

Collected by C. Forbes

Date 3/18/80

(3) Number or Name	Well #11		
Date drilled	1954		
(4) Location: Neighborhood	Rural		
Size of lot			
Distance to: Sewer	> 50'		
Sewage disposal	None		
Abandoned well	>100'		
Nearest property line	>450'		
(5) Housing: Type	Metal		
Condition	Good		
Pit depth (if any)	None		
Floor (material)	Concrete		
Drainage	Away		
(6) Well Depth	80'		
(7) Casing: Depth	80'		
Diameter	10"		
Kind	Steel		
Height above floor	--		
Distance to highest perforations	Unknown		
Surface sealed (yes or no)	Yes		
Gravel pack (yes or no)	No		
Second casing depth	--		
Second casing diameter	--		
Annular seal (depth)	Unknown		
(8) Impervious Strata: { Thickness	Unknown		
Penetrated { Depth to	"		
(9) Water Levels: { Surface	--		
Depth to { Static	Unknown		
{ When pumping	--		
(10) Pump: Make	Gordon		
Type	DWT		
Capacity, g.p.m.	25		
Lubrication	Water		
Power	2 HP Elect		
Auxiliary power	None		
Control	APSI		
Discharge location	Above		
Discharge to	PT		
(11) Frequency of Use	Daily		
(12) Flood Hazard	Nil		
(13) Remarks and Defects (Use other side if necessary)	No Well Log		

(14) Show well log on other side.

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH

CHLORINATION DATA

(1) Place and Owner: Castle Air Force Base - Wells Nos. 1, 2, 3 & 4

(2) Source of Information: Joe Reilly

Collected by: Carl Carlucci

Date: November 20, 1980

(3) Application:

Water treated (raw, filtered, etc.): Raw

Chlorine demand character: Low

Point of application: Manifold of well discharges

Mixing: Good

Contact time before use: Unknown

Contact time before residual test: Unknown

Water flow variation: Constant Flow

How measured: Flow Meter

(4) Machine:

Make: Wallace & Tiernan

Type: V-800 control module

Capacity: 30 lb/day

Condition: Good

Holds setting well? Yes

(5) Housing:

Insulation: Metal building

Heating: None

(6) Chemical Added (% available chlorine, form): 100% gas

Cylinder or crock capacity: 150 lbs

Stock on hand: One backup at site; more available at sewage treatment plant site

(7) Operation and Maintenance:

Lapse during changes: Minimal

Lapse during repairs: Unknown

Spare parts on hand: Yes

Ability to make repairs: Adequate

Visits to machine: 2/day

When or how often:

Distance to travel:

Other duties:

Residual Tests:

Test Made (O.T., O.T.A., etc.): DPD

Tester Used: Hach

How often: Daily

Where test made: Distribution system

Results (Indicate free or combined): About 0.5 ppm

Records: Yes

(8) Condition of Scales (if any): Good

(9) Complaints:

(10) Defects and Remarks:

Wells Nos. 1, 2, 3 & 4 supply the main base system.

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH

CHLORINATION DATA

- (1) Place and Owner: Castle Air Force Base - Wells Nos. 7 & 8
- (2) Source of Information: Joe Reilly
Collected by: Carl Carlucci Date: November 20, 1980
- (3) Application: Raw
Water treated (raw, filtered, etc.):
Chlorine demand character: Low
Point of application: Pressure Tank Influent
Mixing: Good
Contact time before use: Unknown
Contact time before residual test: Unknown
Water flow variation: Constant flow
How measured: Flow meter
- (4) Machine: Fischer & Porter
Make: Gas cylinder - mounted
Type: One 10 lb/day rotameter for each well
Capacity: Good
Condition: Yes
Holds setting well?
- (5) Housing: Metal building
Insulation: None
Heating:
- (6) Chemical Added (% available chlorine, form): 100% gas
Cylinder or crock capacity: 150 lbs
Stock on hand: One backup at site; more available at sewage treatment plant site
- (7) Operation and Maintenance:
Lapse during changes: Minimal
Lapse during repairs: Unknown
Spare parts on hand: Yes
Ability to make repairs: Adequate
Visits to machine: 2/day
When or how often:
Distance to travel:
Other duties:
Residual Tests: DPD
Test Made (O.T., O.T.A., etc.):
Tester Used: Hach
How often: Daily
Where test made: Pressure tank effluent
Results (Indicate free or combined): About 0.5 ppm
Records: Yes
- (8) Condition of Scales (if any): Good
- (9) Complaints:
- (10) Defects and Remarks:
Wells Nos. 7 & 8 supply the Castle Gardens system.

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH

CHLORINATION DATA

- (1) Place and Owner: Castle Air Force Base - Well No. 5
- (2) Source of Information: Joe Reilly
Collected by: Carl Carlucci Date: November 20, 1980
- (3) Application:
Water treated (raw, filtered, etc.): Raw
Chlorine demand character: Low
Point of application: Well discharge
Mixing: Good
Contact time before use: Unknown
Contact time before residual test: Unknown
Water flow variation: Constant flow
How measured: Flow meter
- (4) Machine:
Make: Bruner Corporation
Type: Hypochlorinator
Capacity: 24 GPD
Condition: Good
Holds setting well? Yes
- (5) Housing:
Insulation: Concrete block building
Heating: None
- (6) Chemical Added (% available chlorine, form): 5.5% sodium hypochlorite
Cylinder or crock capacity: 6.5 gallons
Stock on hand: 6 gallons minimum
- (7) Operation and Maintenance:
Lapse during changes: Minimal
Lapse during repairs: Unknown
Spare parts on hand: Yes
Ability to make repairs: Adequate
Visits to machine:
When or how often: 2/day
Distance to travel:
Other duties:
Residual Tests:
Test Made (O.T., O.T.A., etc.): DPD
Tester Used: Hach
How often: Daily
Where test made: Distribution system
Results (Indicate free or combined): About 0.5 ppm
Records: Yes
- (8) Condition of Scales (if any): None
- (9) Complaints:
- (10) Defects and Remarks:

Wells Nos. 5 & 6 supply the W.A.S. system.

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH

DISTRIBUTION DATA

- (1) Place and Owner: Castle Air Force Base - Main Base System
- (2) Source of Information: Chuck Locken and Master Plan
Collected by: Carl Carlucci Date: November 20, 1980
- (3) Materials: 6, 8, 10 and 12 inch cast iron and asbestos cement
Mains: Good
Condition: Good
Lead, copper, brass (extent): None
Joints: Mechanical and rubber ring
- (4) Distance of Mains from Sewers: >10 feet
(Past practice, future policy)
- (5) Disinfection (method): AWWA
New Mains: AWWA
After Repairs: AWWA
- (6) Infiltration Hazard: Nil
(Relationship to ground water table, underwater lines, etc.)
- (7) Pressure Range: 55-65 psi
- (8) Cross-Connection and Backflow Prevention:
Private supplies (kind and extent): None
Cross-Connections:
With Other Potable and Supervision: None
With Non-Potable, if so, What Protection: None
Plumbing Code or Regulations: Uniform plumbing code and state regulation
- (9) Dead Ends (extent): None
Growths and Sludge in Mains: None
Flushing: Quarterly
- (10) Defects and Remarks:

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

RESERVOIR (Use for all distribution storage, chlorine contact tanks, sand traps, etc.)

(1) Place and Owner: Castle Air Force Base

(2) Source of Information: Chuck Locken and Master Plan

Collected by: Carl Carlucci Date November 20, 1980

	No. 706	No. 1723
(3) Number or Name		
Date constructed:		
Purpose (storage, sand trap, etc.):	Storage	Storage
Capacity:	500,000 gallons	15,000 gallons
(4) Location: (specific)	9th Street	W.A.S. area
Neighborhood:	Military	Military
Size of lot:	About 200' x 200'	
Fencing:	Chain link	None
(5) Construction:		
Material:	Steel	Steel
Sides:		
Floor:	Steel	Steel
Cover or roof:	Steel	Steel
Height top of walls above ground:	150'	115'
Surface drainage to reservoir possible?	No	No
Ventilation:	Yes	Yes
Screening:	Yes	Yes
(6) Inlet and Outlet Arrangement:		
Inlet:		
Location:	Near top of tank	Center column
Distance above bottom:	About 25'	About 4"
Outlet:		
Distance from inlet:	About 23'	Common inlet-outlet
Distance above bottom:	About 2'	About 4"
Drain to where:	Street	Ground
Overflow to where:	Ground	Ground
Sewer or other hazardous connection (if so, make sketch on back):	None	None
(7) Relation to System:		
Receives from:	Wells Nos. 1, 2, 3 & 4	Wells Nos. 5 & 6
Delivers to:	Main portion of base distribution system	W.A.S. Distribution System
(8) Defects and Remarks: (Include statements on cleaning practices, condition of structure—particularly of roof, dimensions and shape of reservoir, leakage, kind and location of access openings, protection against insects, birds and rodents.)		

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH

CHLORINATION DATA

(1) Place and Owner: Castle Air Force Base - Well No. 5
(2) Source of Information: Joe Reilly
Collected by: Carl Carlucci Date: November 20, 1980

(3) Application:
Water treated (raw, filtered, etc.): Raw
Chlorine demand character: Low
Point of application: Well discharge
Mixing: Good
Contact time before use: Unknown
Contact time before residual test: Unknown
Water flow variation: Constant flow
How measured: Flow meter

(4) Machine:
Make: Bruner Corporation
Type: Hypochlorinator
Capacity: 24 GPD
Condition: Good
Holds setting well? Yes

(5) Housing:
Insulation: Concrete block building
Heating: None

(6) Chemical Added (% available chlorine, form): 5.5% sodium hypochlorite
Cylinder or crock capacity: 6.5 gallons
Stock on hand: 6 gallons minimum

(7) Operation and Maintenance:
Lapse during changes: Minimal
Lapse during repairs: Unknown
Spare parts on hand: Yes
Ability to make repairs: Adequate
Visits to machine:
When or how often: 2/day
Distance to travel:
Other duties:
Residual Tests:
Test Made (O.T., O.T.A., etc.): DPD
Tester Used: Hach
How often: Daily
Where test made: Distribution system
Results (Indicate free or combined): About 0.5 ppm
Records: Yes

(8) Condition of Scales (if any): None

(9) Complaints:

(10) Defects and Remarks:

Wells Nos. 5 & 6 supply the W.A.S. system.

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH

CHLORINATION DATA

(1) Place and Owner: Castle Air Force Base - Well No. 6
(2) Source of Information: Joe Reilly
Collected by: Carl Carlucci Date: November 20, 1980

(3) Application:
Water treated (raw, filtered, etc.): Raw
Chlorine demand character: Low
Point of application: Well discharge
Mixing: Good
Contact time before use: Unknown
Contact time before residual test: Unknown
Water flow variation: Constant flow
How measured: Flow meter

(4) Machine:
Make: Bruner Corporation
Type: Hypochlorinator
Capacity: 24 GPD
Condition: Good
Holds setting well? Yes

(5) Housing: Concrete block building
Insulation: None
Heating:

(6) Chemical Added (% available chlorine, form): 5.5% sodium hypochlorite
Cylinder or crock capacity: 6.5 gallons
Stock on hand: 6 gallons minimum

(7) Operation and Maintenance:
Lapse during changes: Minimal
Lapse during repairs: Unknown
Spare parts on hand: Yes
Ability to make repairs: Adequate
Visits to machine:
When or how often: 2/day
Distance to travel:
Other duties:
Residual Tests:
Test Made (O.T., O.T.A., etc.): DPD
Tester Used: Hach
How often: Daily
Where test made: Distribution system
Results (Indicate free or combined): About 0.5 ppm
Records: Yes

(8) Condition of Scales (if any): None

(9) Complaints:

(10) Defects and Remarks:
Wells Nos. 5 & 6 supply the W.A.S. system only.

TRIPPLICATE
Owner's Copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in
No. 242861

Notice of Intent No. _____
Local Permit No. or Date _____

State Well No. _____
Other Well No. _____

(1) OWNER: Name CASTLE AIR FORCE BASE

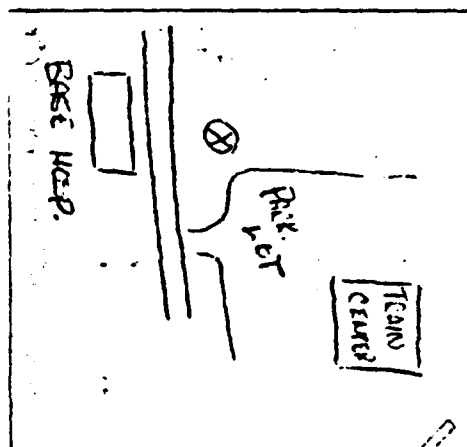
Address _____
City Castle AFB, Ca. 95342 Zip _____

(2) LOCATION OF WELL (See instructions):
County _____ Owner's Well Number _____

Well address if different from above _____

Township _____ Range _____ Section _____

Distance from cities, roads, railroads, fences, etc. _____



WELL LOCATION SKETCH

(3) TYPE OF WORK:

New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐

Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic ☒
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(12) WELL LOG: Total depth _____ ft. Depth of completed well _____ ft.

from ft. to ft. Formation (Describe by color, character, size or material)

0	-	3	top soil
3	-	7	Packed cl
7	-	18	sandy clay
18	-	60	sand
60	-	62	clay
62	-	64	sand & Gravel
64	-	71	clay
71	-	87	rocks
87	-	94	silt
94	-	105	hard grey clay
105	-	112	sand
112	-	118	clay
118	-	125	sand
125	-	132	soft grey clay
132	-	138	pink clay
138	-	142	set sand
142	-	144	white sand & gravel
144	-	156	grey clay
156	-	162	pink clay
162	-	173	set sand
173	-	183	pink clay
183	-	189	hard clay
189	-	194	soft clay
194	-	199	set sand
199	-	203	soft brown clay/set sand
203	-	215	sand
215	-	254	soft brown clay
254	-	273	grey clay
273	-	292	sandy clay
292	-	301	sand
301	-	327	soft clay
327	-	332	sand
332	-	354	soft clay
354	-	369	rocks in clay
369	-	377	grey clay
377	-	381	pink clay
381	-	394	brown clay
394	-	401	set sand

(5) EQUIPMENT:

Rotary ☐ Reverse ☐
Cable ☒ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:

Yes ☒ No ☐ Size _____
Diameter of bore _____
Packed from _____ to _____ ft.

(7) CASING INSTALLED:

Steel ☒ Plastic ☐ Concrete ☐

(8) PERFORATIONS:

Type of perforation or size of screen _____

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	148	24	8			
0	260	18	6			
260	535	16	8	261	531	1/8x1/2

Is surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 160 ft.

Were struts sealed against pollution? Yes ☐ No ☐ Interval _____ ft.

Method of sealing Lat Cement Grout/ Blank Cased-260

(10) WATER LEVELS:

Depth of first water, if known 37 ft.

Standing level after well completion 58 - 3 min. Rec. ft.

(11) WELL TESTS:

Was well test made? Yes ☐ No ☐ If yes, by whom? Anderson

Type of test Pump ☒ Bailer ☐ Air lift ☐

Depth to water at start of test 37 ft. At end of test 37 ft.

Discharge 5,336 gal/min after 100 hours Water temperature _____

Chemical analysis made? Yes ☐ No ☐ If yes, by whom? _____

Was electric log made? Yes ☐ No ☐ If yes, attach copy to this report

Work started 6/29/64 19____ Completed 9/6/64 19____

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED John F. Stewart (Well Driller)

NAME JOHN F. STEWART, INC.

(Person, firm, or corporation) (Typed or printed)

Address 2523 River Rd.

City Modesto, Ca. Zip 95351

License No. 446670 Date of this report 9/25/64

DWR 100 (REV. 7-70) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

1288SAS 011

DEPARTMENT OF WATER RESOURCES
BUREAU OF RECLAMATION
WATER CONTROL DISTRICT NO. 1

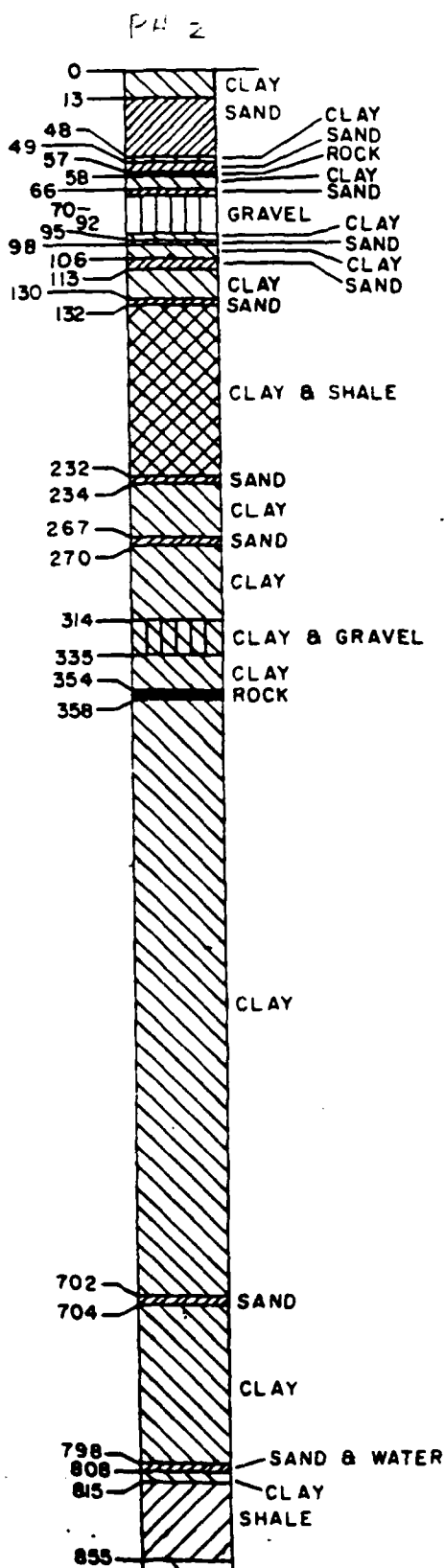
WELL LOG CONTINUED

401	-	439	soft brown clay
439	-	443	soft sand
443	-	449	soft clay
449	-	455	silt
455	-	483	soft clay
483	-	489	set sand
489	-	495	soft red clay
495	-	500	gray soft clay
500	-	506	pink soft clay
506	-	519	brown soft clay
519	-	525	silt
525	-	529	sand & gravel
529	-	547	clay
547	-	552	set sand
552	-	612	soft clay
612	-	616	sandy clay
616	-	635	soft clay
635	-	641	hard clay
641	-	644	sand
644	-	670	soft clay
670	-	677	set sand
677	-	712	black set sand
712	-	716	rocks
716	-	728	black set sand
728	-	736	brown set sand
736	-	744	pink clay
744	-	766	hard clay
766	-	794	set sand
794	-	804	black sand

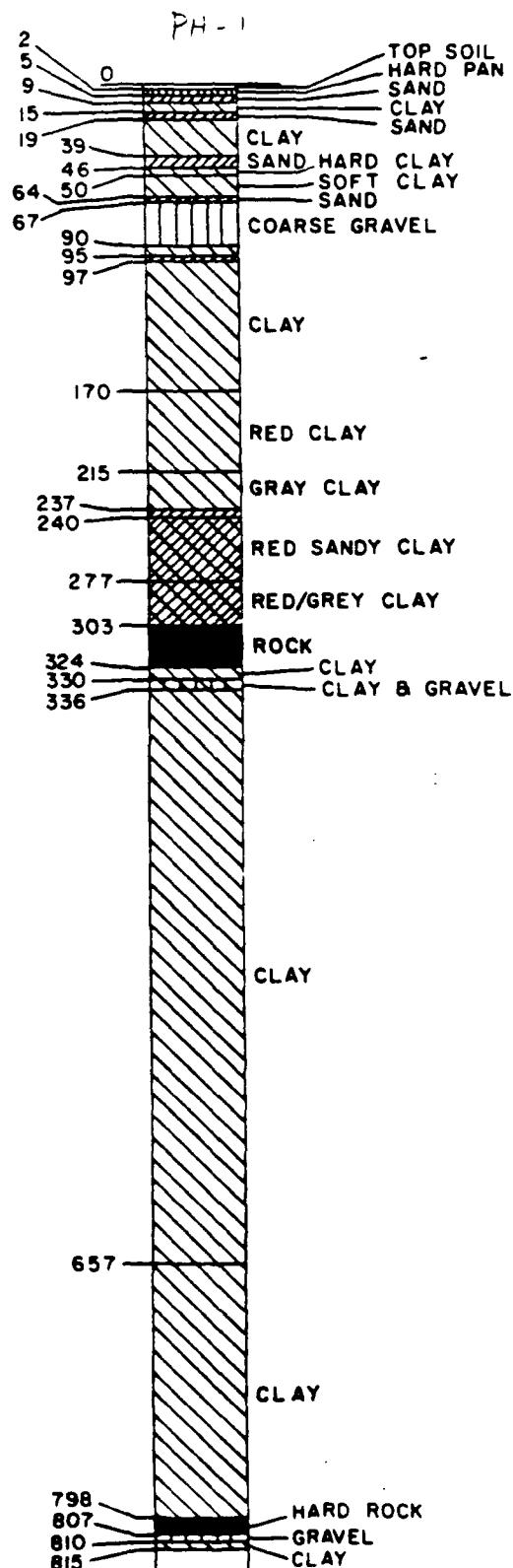
TEST WELL LOGS

CASTLE AFB, CA

MAR, 1984



TEST WELL NO. 2

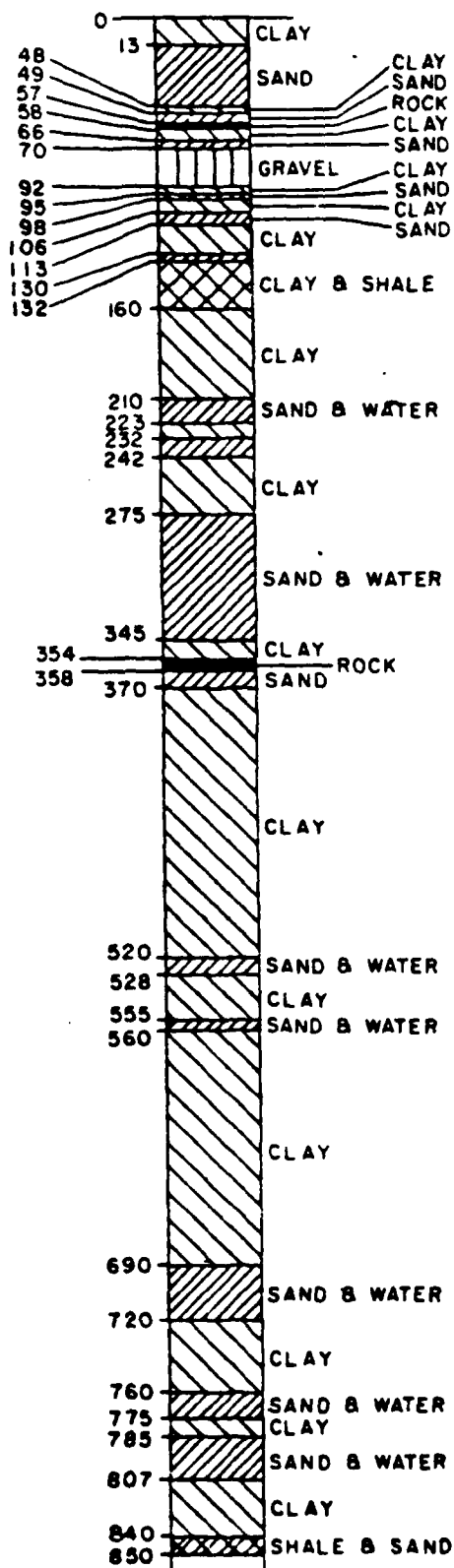


TEST WELL NO. 1

WELL TEST BORING

CASTLE AFB, CA

MAR, 1984



D-159

ELECTRICAL DATA

TEST WELL DATA

0-2 - TOP SOIL

215-237 GREY CLAY

2-5 HARD PAN

237-240 SAND

5-9 SAND

240-277 RED SANDY CLAY

9-15 CLAY

277-303 RED + GREY CLAY + SH

15-19 SAND

303-324 ROCK

19-39 CLAY

324-330 CLAY

39-46 SAND

330-336 GRAVEL + CLAY

46-50 HARD CLAY

336-657 CLAY

50-64 SOFT CLAY

657-798 CLAY

64-67 SAND

798-807 HARD ROCK
~~807-810 Sand & gravel~~

67-90 COARSE GRAVEL

807-810 GRAVEL - LITTLE WATER

90-95 CLAY

810-815 CLAY

95-97 SAND

97-170 CLAY

170-215 RED CLAY

TEST WELL DATA

0-2 - TOP SOIL

2-5 HARD PAN

5-9 SAND

9-15 CLAY

15-19 SAND Little water

19-39 CLAY 

39-46 SAND Little water

46-50 HARD CLAY

50-64 SOFT CLAY

64-67 SAND Little water

67-90 COARSE GRAVEL dry

90-95 CLAY

95-97 SAND dry

97-170 CLAY

170-215 RED CLAY

215-237 GREY CLAY

237-240 SAND dry

240-277 RED SANDY CLAY

277-303 RED + GREY CLAY + SA

303-324 ROCK

324-330 CLAY

330-336 GRAVEL + CLAY

336-657 CLAY

657-798 CLAY

798-807 HARD ROCK

807-810 GRAVEL - LITTLE WATER

810-815 CLAY

TEST WELL

3/28/84

2135-4568

STARTED DRILLING SECOND WELL AT 9:45 A.M.

0-13 CLAY
13-48 SAND
48-49 CLAY
49-57 SAND
57-58 ROCK
58-66 CLAY
66-70 SAND
70-92 GRAVEL
92-95 CLAY
95-98 SAND
98-106 CLAY
106-113 SAND
113-130 CLAY
130-132 SAND
132-232 CLAY & SHALE
232-234 SAND
234-267 CLAY
267-270 SAND
270-314 CLAY

³³⁵
314-CLAY GRAVEL
335-354 CLAY
354-358 ROCK
358-702 CLAY
702-704 SAND-WATER
704-798 CLAY
798-808 SAND WATER
WILL TEST
808-815 CLAY
815-855 SHALE

4/2/84 STARTED
BLUING WELL AT 742 FT.
AT 2:00 O'CLOCK STARTED
PUMPING AT 3:30 O'CLOCK
AND PUMPED ALL NIGHT.
4/3/84 TOOK WATER
SAMPLES AT 9 A.M. BY
HOSP & US GOVERNMENT

GEO-HYDRO-DATA

INCORPORATED

ELECTRIC WELL LOG

REF-6000

COMPANY **CASTLE AIR FORCE BASE**
WELL **TEST NO. 2**
FIELD **ATWATER**
COUNTY **MERCED** STATE **CALIF.**

COMPANY **CASTLE AIR FORCE BASE**

WELL **TEST NO. 2**

FIELD **ATWATER**

COUNTY **MERCED**

STATE **CALIF.**

LOCATION

CASTLE AIR FORCE BASE

Sec. _____ Twp. _____ Rge. _____

TYPE LOG

**SP
PR
6' LATERAL**

Permanent Datum **GROUND LEVEL**

Elev. _____

Elev. **K. B.**

Log Measured From **G.L.** **0** Ft. Above Perm. Datum

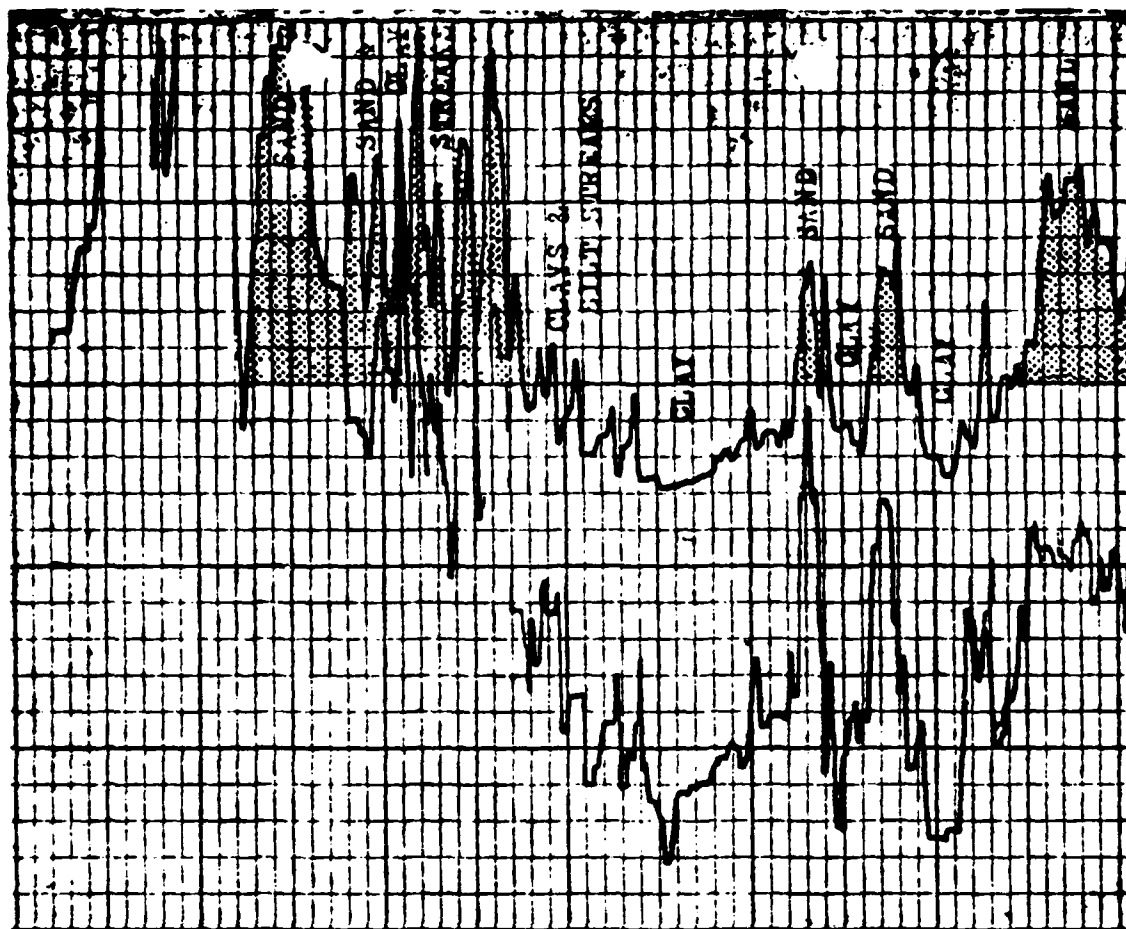
D. F. _____

Drilling Measured From **G.L.**

G. L. _____

Date	March 30, 1984		
Run No.	one		
Depth — Driller	855	R.	R.
Depth — GHD	852	R.	R.
Blm. Log Inter.	851	R.	R.
Top Log Inter.	10	R.	R.
Casing — Driller		R.	R.
Casing — GHD		R.	R.
Bit Size	7 7/8	855	R.
Bit Size		R.	R.
Bit Size		R.	R.
Type Fluid in Hole	clay gel		
Source of Sample	ditch		
PPH TDS	200		
Fluid Level	full	R.	R.
Dens.	Visc.		
pH	Fluid Loss		
Run @ Meas. Temp.			
Run @ Meas. Temp.			
Run @ Meas. Temp.			
Time Since Cir.	24	R.	R.
Logging Speed	45	R/min.	R/min.
Tool Type and No.	Combo 5		
Unit No.	3		
Location	Paco Robles		
Invoice No.	3326		
Recorded By	Kenny Menz Associate Geologist		
Witnessed By			
Other			

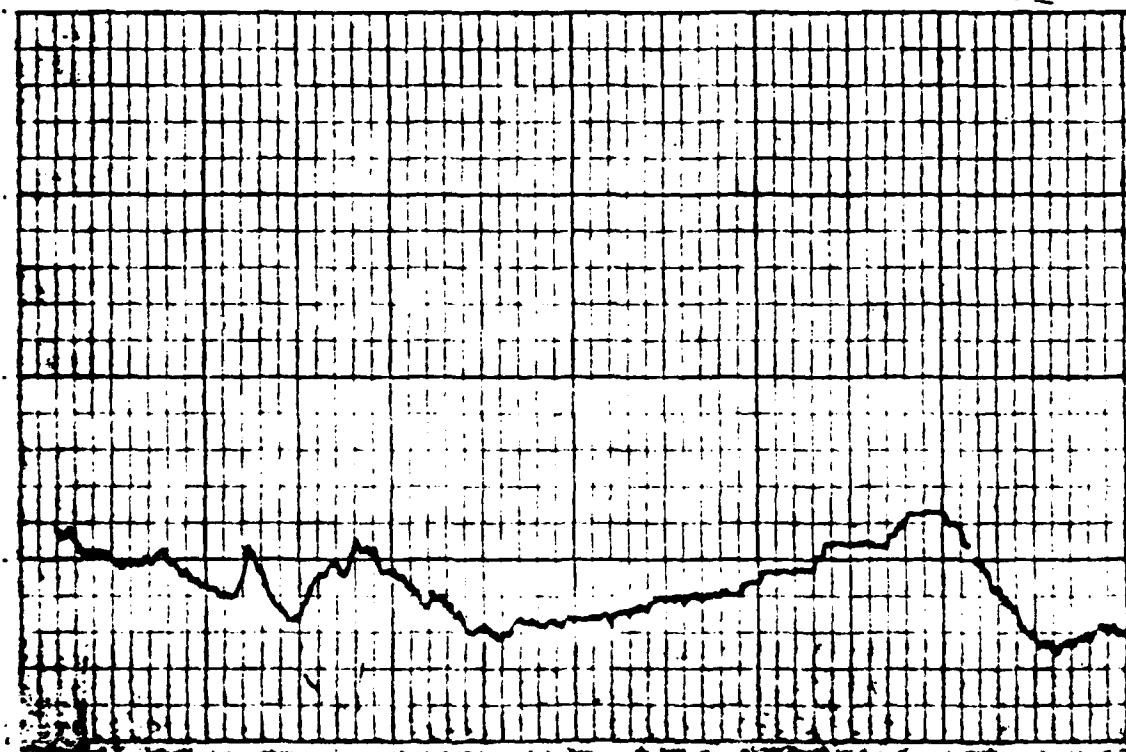
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100

200

300

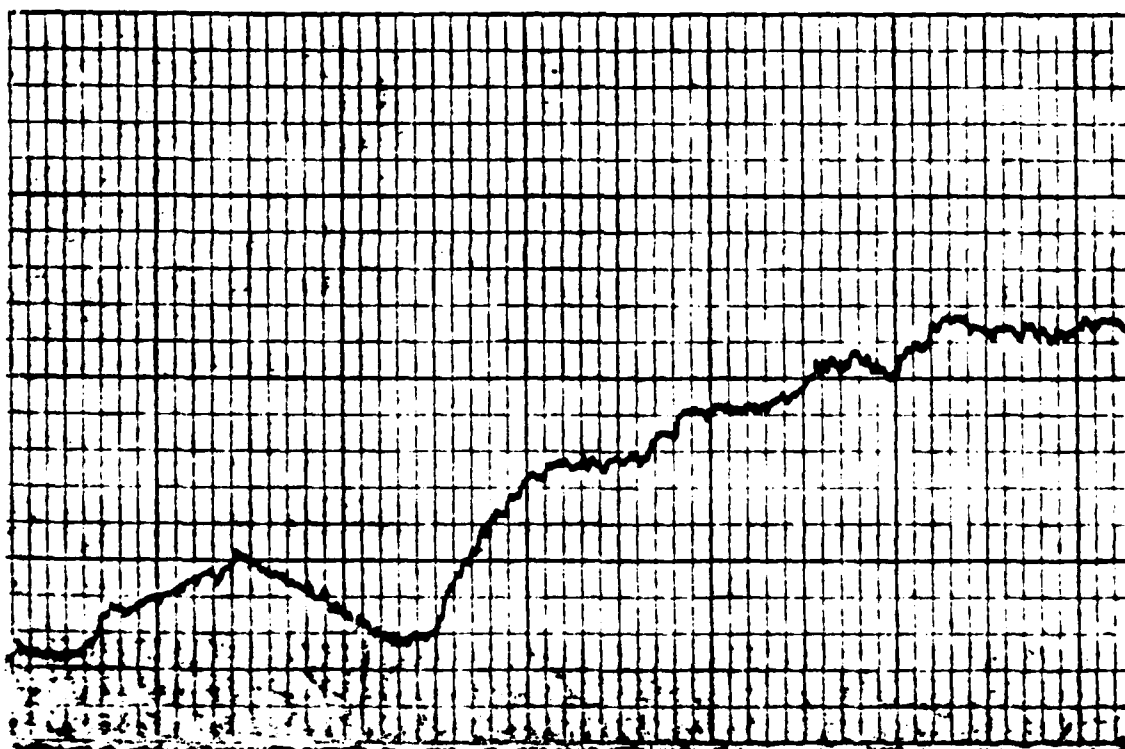


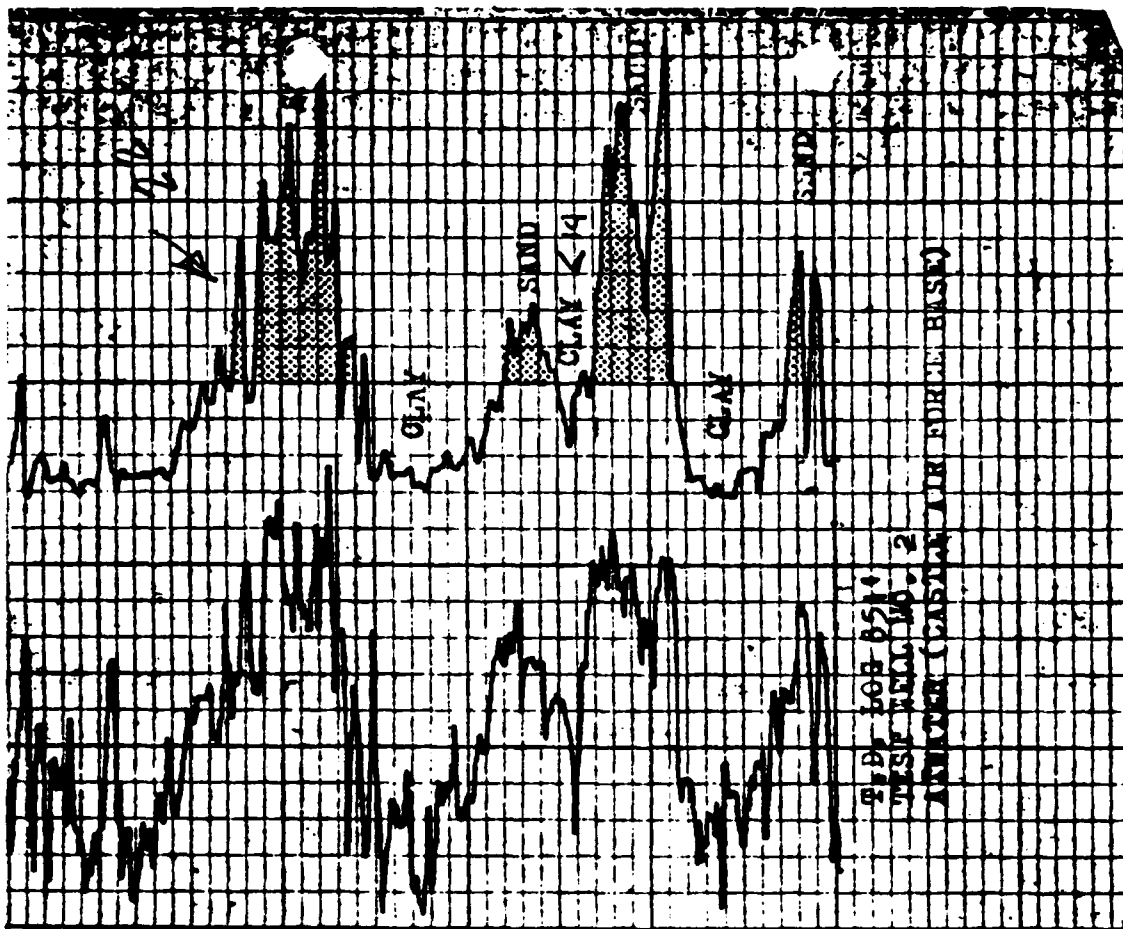


400

500

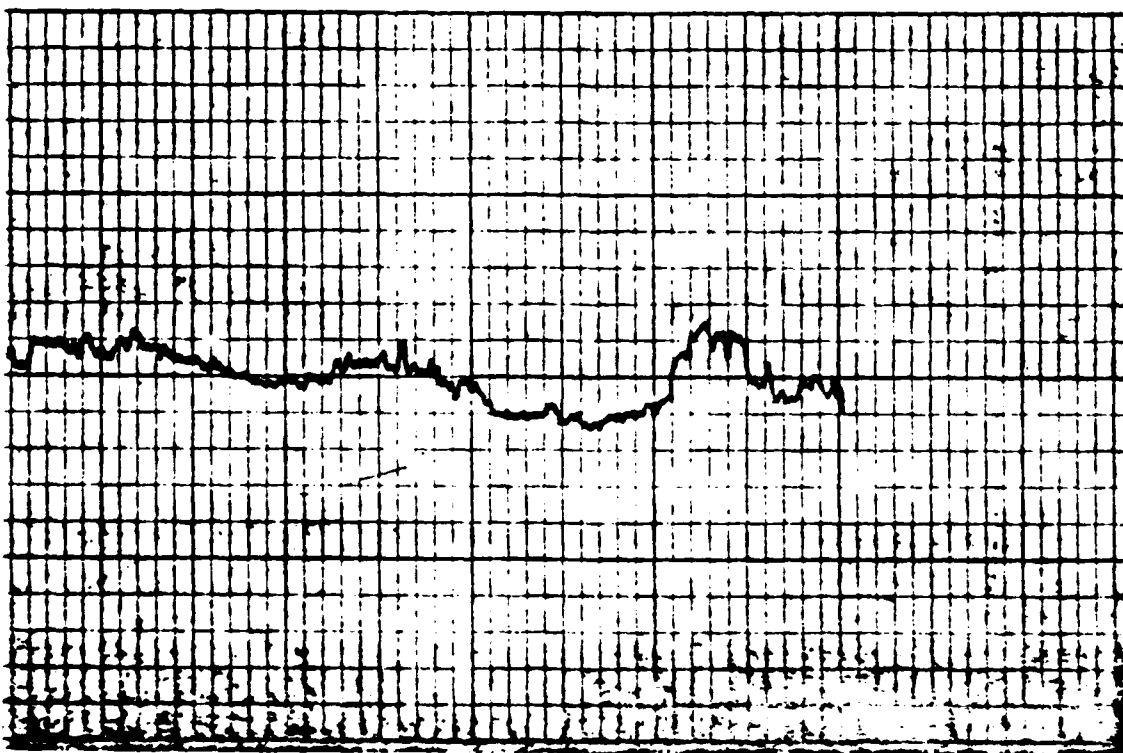
600





700

800



END
DITIC

7-86